

AUTOMOTIVE INDUSTRIES

AUTOMOBILE

Reg. U. S. Pat. Off
Published Weekly

Volume 73

Number 16

JULIAN CHASE, Directing Editor

F. M. HELDT, Engineering Editor
JOS. GESCHELIN, Detroit Technical Editor
HAROLD E. GRONSETH, Detroit News Editor

JEROME H. FARRIS, Ass't Editor
T. LAWTON SLAUGH, News Editor
GEOFFREY GRIER, Art Editor

Contents

News of the Industry	499
Business in Brief	506
Calendar of Coming Events	508
Production Lines	509
The Horizons of Business	510
Easier Steering, All Silent Transmission, Pressed Steel Wheels Feature the New Fords	512
New Hood and Fender Treatment Marks the 1936 Dodge Line	515
Nineteen Body Styles on Three Models Make Up Pontiac Line. By Joseph Geschelin	516
Paris Show Reveals Trend Toward Full Width Bodies Without Running Boards. By W. F. Bradley	520
Design Trends Stimulate Interest in Powerplant-Drive Units. Part V. By Athel F. Denham	522
Tractor and Transportation Activities of the S.A.E. Hold Annual Meeting in Chicago	528
New Developments	528
Advertisers' Index	47

C. A. MUSSELMAN, Pres. and Gen. Mgr.; J. S. HILDRETH, Vice-Pres. and Manager; W. I. RALPH, Vice-Pres.; G. C. BUZBY, Vice-Pres.

OFFICES

Philadelphia—Chestnut & 56th Sts., Phone Sherwood 1424
New York—239 W. 39th St., Phone Pennsylvania 6-1100. Chicago—Room 1116 London Guarantee & Accident Bldg., Phone Franklin 9494. Detroit—814 Stephenson Bldg., Phone Madison 2090. Cleveland—609 Guardian Bldg., Phone Main 6860. Boston—301 United Shoe Bldg., Phone Liberty 4490. San Francisco—44 Market St., Room 305, Phone Garfield 6788. Long Beach, Cal.—1595 Pacific Ave., Phone Long Beach 613-258.
Cable Address Autoland, Philadelphia

SUBSCRIPTION RATES: United States, United States Possessions, and all countries in the Postal Union, \$1.00 per year; Canada and Foreign, \$4.00 per year. Single Copies, 25c.

Member of the Audit Bureau of Circulations

Member Associated Business Papers, Inc.

Entered as second-class matter Oct. 1, 1925, at the post office at Philadelphia, Pa., under the act of March 3, 1879.
Automotive Industries—The Automobile is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903, the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Owned, Published and Copyrighted by



CHILTON COMPANY

(Incorporated)

Executive Offices

Chestnut and 56th Streets, Philadelphia, Pa., U. S. A.

C. A. MUSSELMAN, President

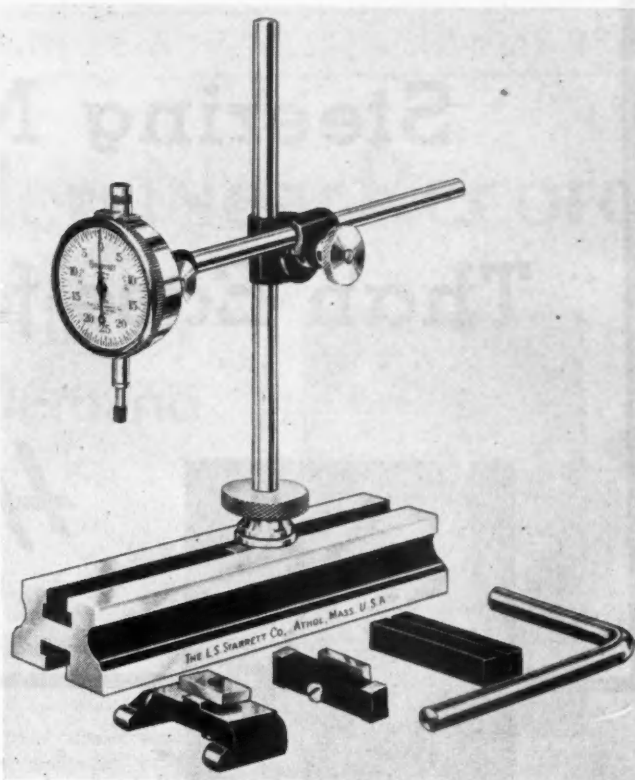
FRITZ J. FRANK, Executive Vice-President

FREDERIC C. STEVENS, JOSEPH S. HILDRETH, GEORGE H. GRIFFITHS, EVERETT B. TERHUNE, ERNEST C. HASTINGS, Vice-Presidents

WILLIAM A. BARBER, Treasurer. JOHN BLAIR MOFFETT, Secretary

Automotive Industries

FOR AUTOMOTIVE WORK



A NEW STARRETT DIAL TEST INDICATOR

Starrett Dial Test Indicator No. 665 has been designed especially to suit the requirements of automotive inspectors, machinists and toolmakers. It combines maximum flexibility with extreme accuracy—makes measuring or inspecting a wide range of work *easier, quicker and more precise.*

The horizontal arm and the right angle arm provide for an infinite variety of adjustments either on the base or in the tool post of a lathe. The small blocks can be clamped in the T-slots of the base as a guide for checking from the edge of a T-slot or work plate.

The complete line of Starrett Dial Indicators is described and illustrated in the special Dial Indicator Catalog "NA". Write for your copy.

DIAL TEST INDICATOR CLAMP No. 665G



with long arm and 3" clamp capacity; exceptionally useful in the inspection of jigs and fixtures, lining up vises, work on centers, machine platens, etc.

THE L. S. STARRETT CO.

World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
ATHOL, MASS., U. S. A.

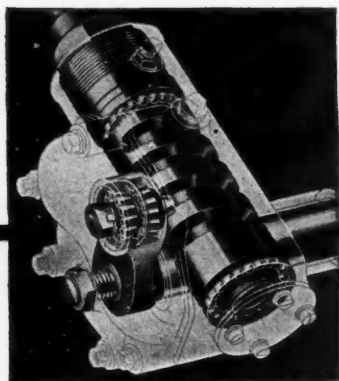
Starrett

Dial Indicators

6494

October 19, 1935

Steering Needs More Than Ease for *Safety at High Speeds*



DEFINITE STABILITY must be present for complete steering safety at high speeds. Ease alone is not enough. Ross Steering, through its exclusive cam and lever design, combines the essential steadiness without sacrificing the desirable easy wheel-turn. Thus it gives utmost satisfaction at all speeds.

ROSS GEAR AND TOOL COMPANY • LAFAYETTE, INDIANA

ROSS



STEERING

October 19, 1935

Automotive Industries

New Model Orders Near Record

Show Time Supply Unlikely To Meet Customers' Demand

by Harold E. Gronseth

Detroit News Editor, Automotive Industries

With a majority of the dealer previews of 1936 models over, factory sales departments are being swamped with orders and the big problem now is to get enough cars in the field to meet initial demand. While, generally speaking, dealers this year will be better

sampled on new models than they have been at introduction time for many years, they still will lack sufficient stocks for prompt delivery when the curtain rises on the 1936 selling season. Consequently the next 30 days is likely to see a scramble for the new cars by dealers attempting to build up adequate inventories to take care of the anticipated demand.

Factory crews returning from dealer meetings throughout the country are in an optimistic frame of mind. With few exceptions they have found conditions good in all sections and indications of a ready demand for the new models. Some dealers have had such success selling from catalogues and pictures that they have stepped-up their original orders with the factories. One of the leading producers already has booked enough orders to insure capacity production for the next two months.

By Oct. 14, just a little more than two weeks after new model introduction, Packard had received orders for 12,744 cars and was shipping as high as 490 cars a day. Hudson has more than 20,000 unfilled orders on hand

and is working on initial dealer requirements of 25,000 with production running between 300 and 400 cars daily. Buick is turning out 750 cars a day and has orders for 20,000 cars. One week after introduction Cadillac had received orders for \$6,972,000 worth of new models. A week after Dodge factory executives had conducted dealer meetings throughout its regional divisions dealer orders had been received for \$52,000,000 worth of Dodge and Plymouth passenger cars and Dodge trucks, which compares with \$30,000,000 worth at similar juncture of its program last year. One day's orders by 14 Dodge dealers in metropolitan Detroit amounted to \$2,000,000 and called

(Turn to Page 506, Please)



M. E. Coyle

Announced Chevrolet's \$25,000,000 Expansion

Frost Succeeds Vesper as NADA General Manager

Jack Frost has succeeded F. W. A. Vesper as general manager of NADA. Mr. Frost, previously assistant to Mr. Vesper, will serve in his new capacity for one year, according to the NADA directors' announcement. Mr. Vesper remains as president of the dealer organization.

Chevrolet Increases Output Capacities 25% in \$25,000,000 Expansion Program

M. E. Coyle, president of the Chevrolet Motor Company, has announced that the company has completed during the current year a \$25,000,000 program of plant expansion, increasing the production capacity of the 10 Chevrolet assembly plants in the United States by 25 per cent, and raising the capacity of the company's own manufacturing plants, devoted to the making of axles, engines, transmissions and other units, to enable them to keep pace with the enlarged assembly plants.

The expenditure of \$25,000,000 was made for the erection and equipment of new buildings at assembly and manufacturing plants, and for the re-equipment and complete

modernization of existing buildings. With few exceptions, most of the operations were undertaken and carried out without announcement to the public, the list of completed improvements just announced being the first publication of details of the program.

Announcement of the virtual completion of the company's 1935 expansion plans was made by Mr. Coyle incidental to his statement that all 10 Chevrolet assembly plants have been changed over within the last several weeks to produce new models of the Master deluxe and Standard Chevrolets for 1936, to be introduced in November, and that the manufacturing plants and assembly plants are already producing the new cars.

(Turn to Page 506, Please)

In This Issue

Design Trends Stimulate Interest in Powerplant-Drive Units, Part V, By Athel F. Denham—Page 522.

Tractor and Transportation Activities of the SAE Hold Annual Meeting in Chicago—Page 528.

Ford, Dodge, Pontiac, 1936 model descriptions—Pages 512, 515, 516.

Paris Show Report by W. F. Bradley—Page 520.

Knudsen, McClintock Warn Against Laws Impairing Car's Efficiency, Usefulness

Recommendations for restrictive legislation which might impair the efficiency and usefulness of the automobile and not correct the accident situation were counseled against this week by William S. Knudsen, executive vice-president of General Motors, and Dr. Miller McClintock, director of Harvard University's Bureau for Street Traffic Research, in their speeches before the annual Congress of the National Safety Council. The meetings this year were held in Louisville, Ky.

Mr. Knudsen stressed the careful control exercised over automobile manufacture by the makers and emphasized that speed per se cannot be held solely accountable for highway accidents involving motor vehicles. He pointed out that while manufacturers can control the production of their product they have no control over who will use the product. Dr. McClintock joined with Mr. Knudsen in emphasizing that proper maintenance of a motor car is an essential safety feature and went into a considerable discussion of the proposals which have been made for compulsory speed governors upon cars and trucks.



Dr. Miller McClintock

Mr. Knudsen's Speech

Discussing the automobile industry and the automobile per se Mr. Knudsen said there are four factors controlling the safe operation of an automobile—1, the car; 2, the driver; 3, the highway, and 4, the other fellow. Taking up the first factor Mr. Knudsen stated he believed the car is to blame only in a small percentage of cases. His reasons were that the design and manufacture of the car is controlled by the maker; large sums have been spent in research laboratories and proving grounds to develop correct design and provide adequate tests before the cars are marketed. Large



W. S. Knudsen

sums, he said, have been spent in finding, perfecting and making available to the public such devices for safety as the self-starter, closed bodies, steel tops, ventilating systems, four-wheel brakes, synchro-mesh transmissions, independently sprung wheels, electric headlights, multibeam headlights and adequate warning signals.

"Manufacturing methods in the automobile industry are still regarded as among the best," Mr. Knudsen told his audience. "Labor is among the highest paid of all industries. Inspection is a highly developed art. As for materials, we are always looking for the best. Much of the demand for alloy steels originated in the automobile

(Turn to page 519, please)

Dr. McClintock's Talk

Dr. McClintock opened his address with the assumption of two extremes—one, that any car safely driven over any highway is safe, and the other, that the finest motor car in the world unsafely driven over the finest highway is an instrument of destruction. The former, Dr. McClintock held, is proved in practice every day; the second, he said, is illustrated daily in newspaper headlines.

Asking the question "Is the average car and the average highway safe for the use of the average driver?" Dr. McClintock said: "Any reasonable view of the 36,000 fatalities from traffic accidents last year and the 800,000 or more personal injuries would seem to warrant an emphatic No. It is possible, however, as every one knows, to be very seriously misled in conclusions based upon averages. For example, we have no adequate knowledge as to whether the great majority of our current fatalities are caused by average normal citizens or by a comparatively small group of persons who are distinctly abnormal with respect to physical, psychological or social conditions. Furthermore, there is an amazing lack of knowledge about the mechanical and physical conditions of the vehicles and highways which contributed to the fatality record."

Discussing vehicle design Dr. McClintock said one could say with a fair degree of confidence that the car buyer would be unable to purchase for any amount of money a mechanism more accurately or beautifully designed to perform its normal function than the current automobile, and that this statement included cars in the lowest as well as the highest price classes. The speaker pointed out that material failures of essential parts have practically disappeared and that the driver has been relieved of almost a score of mechanical functions to which it was formerly necessary to give attention. Most important of all, he pointed out, is the improvement made in braking systems.

"The key to the safety situation," Dr. McClintock said, "so far as the motor vehicle is concerned lies primarily not in the inherent safety features of the new vehicle,

but rather in the degree to which the owner maintains the various component parts of the mechanism in such a condition that they may retain a maximum portion of the efficiency which was originally built into the car. The safest vehicle imaginable may be rendered unsafe in the first five minutes in the hands of a new owner.

"It is entirely possible that over a period of time maximum safety maintenance will be attained by administrative organization which gives assurance that whenever a vehicle is involved in an accident, it shall be subject to such scrutiny as shall determine

(Turn to page 506, please)

NADA's Trade Practice Application to FTC Pends

The Federal Trade Commission has informed NADA that at the present time it does not feel the Federal Trade Act is broad enough to grant the association's application for regulation of trade practices, according to the October *NADA Bulletin*.

While the association's application is still pending before the Commission, the federal body informed the association it would like to discuss further some of the resolutions contained in the request for regulation and cooperate in every way to the limit of its authority. The trouble appeared to hinge about Resolutions 1 and 2 in the NADA application dealing with maintenance of manufacturers' suggested new car delivered price and the limitation of used car allowances.

Oldsmobile 1936 Prices

	New Price		Old Price		Change
Six					
Bus. Coupe	\$665	\$675			—\$10
Sport Coupe	730	725			+ 5
5 Pass. Coupe	730	725			+ 5
Touring Coupe	755	755			None
Convertible Coupe	805	800			+ 5
4 Door Sedan	795	790			+ 5
Touring Sedan	820	820			None
Eight					
Business Coupe	810	860			— 50
Sport Coupe	845	895			— 50
5 Pass. Coupe	845	870			— 25
Touring Coupe	870	900			— 30
Convertible Coupe	935	950			— 15
4 Door Sedan	910	940			— 30
Touring Sedan	935	970			— 35

New Model Introductory Plan Reflected In August Wholesale, Retail Financing

Early shut-downs for model change-overs and normal seasonal trends dropped the dollar volume of wholesale financing for August of this year 22 per cent below the July volume. However, the volume for August this year rose 10 per cent above that for the corresponding 1934 month. As previously pointed out in *Automotive Industries* this volume of wholesale finance indicates a serious undercapitalized position of car dealers.

The new vehicle dollar volume of financing for August dropped approximately 12½

per cent below that for July and rose nine per cent above the August, 1934, volume. For the January-August period of the current year wholesale financing dollar volume increased 35 per cent over that for the similar period last year, while the eight months' retail financing dollar volume this year gained 17 per cent over the same months of 1934.

The accompanying table shows the figures, computed by the Bureau of Census, Department of Commerce, on the basis of 456 organizations.



H. M. Northrup

who has been appointed chief engineer of Hudson

	Aug., 1935	July, 1935	Aug., 1934	Eight Mos., 1935	Eight Mos., 1934
Wholesale financing	\$95,576,294	\$122,238,736	\$86,746,755	\$992,113,262	\$735,462,726
Retail financing					
New vehicle dollar volume	\$65,132,131	\$74,489,758	\$59,822,255	\$500,389,544	\$426,922,264
New vehicle units	116,971	134,054	109,302	916,048	775,016
Per new unit	\$557	\$556	\$547	\$546	\$551
Used vehicle dollar volume	\$40,206,488	\$43,696,574	\$30,153,258	\$285,852,653	\$208,302,915
Used vehicle units	172,348	187,452	131,905	1,218,836	928,119
Per used unit	\$233	\$233	\$229	\$235	\$224
Total dollar volume	\$106,427,285	\$119,372,346	\$91,618,666	\$799,014,226	\$647,022,333
Total car units	292,491	324,633	245,799	2,170,258	1,736,137
Per unit	\$365	\$368	\$373	\$368	\$373

Chevrolet Will Introduce New Models at Show Time

Chevrolet will not introduce its 1936 models before the New York automobile show, Nov. 2, W. E. Holler, general sales manager, told 1,000 members of the company's wholesale organization assembled in Detroit this week for annual sales convention. Business policies and plans for next year were outlined to regional and zone managers at sessions in the General Motors Building which followed performance tests of the new models at the proving grounds. Similar presentations are to be staged for dealers throughout the country prior to the car's introduction. A feature of the activities was the annual banquet at the Book Cadillac hotel, attended by General Motors executives.

The city of Flint will pay tribute to the Chevrolet Motor Co. at a banquet under the auspices of the Chamber of Commerce Wed. evening, Oct. 23. Gov. Frank D. Fitzgerald has accepted an invitation to be present and to speak in behalf of the people of Michigan. Alfred P. Sloan, Jr., president of General Motors; W. S. Knudsen, executive vice-president, and M. E. Coyle, president and general manager of Chevrolet are among the principal speakers. Other officials of General Motors and the entire executive staff of Chevrolet will be present.

Murray Files Data With SEC for New 40,000 Share Issue

Murray-Ohio Manufacturing Co. of Cleveland filed registration statements with the Securities and Exchange Commission at Washington this week for issuance of 40,000 shares of no-par value common stock to be

offered at market price. Otis & Co. of Cleveland was listed as underwriter. Proceeds will be used to retire bonded indebtedness of the company.

Dodge Dealer Advance '36 Orders Total \$52,000,000

Dodge dealer orders received at the factory thus far for 1936 models amount to approximately \$52,000,000 for Dodge and

Plymouth passenger cars and Dodge trucks, according to A. VanDerZee, general sales manager of Dodge.

This year's advance orders compare with \$30,000,000 received last year when 1935 models were announced.

Cadillac-LaSalle Advance Orders Total \$6,972,000

Dealer orders for 1936 Cadillac and LaSalle cars valued at \$6,972,000 have been received to date, the largest dealer demand for new models at this time of the year since before the depression, according to General Sales Manager J. C. Chick.

New Studebaker West Coast Subsidiary To Make Cars, Trucks for Pacific Trade

Paul G. Hoffman, president of the Studebaker Corp., has announced the organization of the Studebaker Pacific Corp., a wholly owned subsidiary with general offices and factory in Los Angeles, Calif. The company will produce and distribute Studebaker products on the Pacific Coast.

C. K. Whittaker, a vice-president of Studebaker, and since 1928 in charge of factory sales activities in the New York territory, has been elected president of the new company. Stanley R. Whitworth is first vice-president in charge of production.

M. E. Hewins, who has been Studebaker regional manager in Cleveland, Ohio, goes to New York as zone manager. John W. Merrin, for several years San Francisco regional manager, succeeds Mr. Hewins as regional manager in Cleveland.

The factories of the new corporation, which are being erected now, will produce

both cars and trucks to supply Studebaker distributors and dealers in California, Oregon, Washington, Utah, Nevada, Arizona and New Mexico and the Hawaiian Islands. This includes the territory covered by the Los Angeles, San Francisco and Portland regional managers. There will be no change in the functioning of these branches which hereafter will operate under Studebaker Pacific corporation. Some export markets also will draw cars and trucks from this new Los Angeles plant, where several hundred men and women will be employed. The factory buildings will be of the most modern one-floor construction, built of concrete and steel. Mr. Whittaker, who will take up his new duties on the west coast in a few days, has announced the appointment of Cleto Mulick to be in charge of the Portland branch territory. T. F. Laughlin, who has been in charge of the Portland branch, is being transferred as San Francisco regional manager.

Tjaarda Rear Engine Car Powerplant Located Forward of Final Drive Gear

A new rear-engined, streamlined "mon-steel" car with independent suspension at front and rear, and semi-automatic clutch and transmission has been under tests for some time by the Briggs Manufacturing Company. It is in reality a further development of the streamlined body designed and engineered by John Tjaarda of the company's engineering staff which was shown at automobile shows two years ago and was illustrated in these columns at the time.

The car as now built is equipped with an eight-cylinder V engine of 221 cu. in. displacement which is located forward of the final drive gear. The transmission is back of the final drive gear and the Lon semi-automatic clutch at the extreme rear of the powerplant unit. An over-drive controlled through a vacuum cylinder by means of a control knob on the dash is incorporated in the transmission. The final drive gear ratio is 3.8, and with the over-drive gear in action the speed reduction between crankshaft and rear wheels is in the ratio of 2.8. The weight of the car is only 2500 lb., which considering that the wheelbase is 125 in., is quite low.

One reason for the comparative small weight is that the powerplant is directly supported on the rear transverse spring, so its weight need not be transmitted to the springs and axles through the intermediary of a chassis frame. In fact, the car has no conventional panel-type frame. However, its body, which is of all-steel construction, including the roof, has a light tubular backbone, the principal object of which is to carry the weight of the passengers.

Use is made of long, square-sectioned

knuckle pins on which the knuckles can slide. At the bottom the knuckle pin is supported in a ball bearing carried at the end of two chromium-molybdenum steel tubes and a pressed-steel cross member on the tubular backbone. At the top the pin is also carried in a ball bearing which is supported by two tubular struts and the body. Knuckle arms are secured to the lower ends of the knuckle pins. One result of this construction is that the knuckle arms do not move up and down relative to the body, which simplifies the steering-linkage problem. The ends of the cross spring are supported from the knuckle through a ball-bearing collar and shackles. Special provisions are made for the lubrication of the knuckle sliding on the square pin, and the parts of the pin not covered by the knuckle are enclosed in rubber bellows to keep out dust and moisture.

At the rear the single transverse spring is bolted to the top of the differential housing. Each wheel spindle is fixed in a light-alloy casting supported by the cross spring at the top and at the bottom by a link pivoted to the engine and transmission housing, this link taking the driving and braking torque. Drive shafts are equipped with Bendix-Weiss constant-velocity universal joints. The connections between the transverse spring and the light-alloy castings carrying the wheel spindles are of the ball type.

Placing the clutch at the extreme rear end of the power unit makes for compactness and also helps to balance the powerplant on the supporting rear spring. A light drive shaft secured to the end of the crankshaft extends through the hollow worm and the hollow main transmission shaft to the driving member of the friction clutch.

More Than 400 Rubber Parts Feature New Plymouth Cars

Announcement was made Thursday that the Plymouth, which will be introduced Oct. 26, will have more than 400 rubber parts, totaling over 40 lb. of rubber mechanical parts per car. For the first time, thick rubber shims will be used between body and frame to improve silencing. Another development is no glare lighting, with a new pre-focused bulb. It also incorporates a fog cap, or opaque coating on the end of the bulb, which eliminates direct rays from the filament. The fog cap is said to penetrate fog and driving rain.

The driven member of the clutch is connected to the main drive pinion of the transmission and through it to the hollow main drive shaft when the drive is direct.

The transmission is of the semi-automatic type, shifting being effected by letting up on the accelerator pedal. In addition to three regular forward speeds the transmission includes an over-drive. Engagement of the over-drive is effected by means of a vacuum cylinder with dash control. Reverse motion is obtained by means of pullrod with knob on the dash. As the brake lever is located at the left of the driver's seat, the front compartment is free of obstructions. There are only two pedals on the toe board, the right one being the accelerator and the left one the brake.

Adjustments and minor repairs can be made on the engine by swinging the back seat forward and removing the top deck over the engine, this deck being held in place by two snap fasteners. At night the work can be done in the light of the rear-corner lamps which are provided with revolving reflectors for the purpose.

Machine Tool Orders Decline After Show

Attributing a decline in the index of machine tool orders to the machine tool show held in Cleveland last month and a drop in foreign orders, The National Machine Tool Builders Association this week placed the index for September at 80.0 as compared with 125.8 in August.

During the show, however, it was pointed out, many general modernization orders were placed which are now awaiting confirmation. Foreign orders show a decline, the September index figure of 25.9 representing a decrease of 46 per cent from the August index figure of 47.6. Foreign orders are expected to recede for the next few months because of the arms embargo placed on Italy.

Pontiac Meetings End

With a pre-showing of 1936 cars to 500 dealers from the Detroit Sales Rooms, Wednesday, Pontiac Motor Co. closed the series of annual dealer meetings held in 24 zone headquarter cities.



Engine Compartment of Tjaarda rear-engined car

Separate Sales Division for Used Cars Expected to be Established by Chevrolet

For the first time in the motor industry a factory sales department is being set up for used cars on a plan approximating the new car sales organization. Giving full recognition to the factory's share of responsibility in moving used cars and aiming to lift that business to a higher plane, W. E. Holler, vice-president and general sales manager of Chevrolet Motor Co., is expected to establish a complete department for used cars, headed by a sales manager with two assistants, one in charge of the eastern half and one the western half of the United States with a manager for each of its nine zones to be established.

These 12 men will spend the next 60 days studying the used car operations of leading independents and the most successful dealers. At the conclusion of their study they will meet with representatives of both types of outlets and with Chevrolet sales executives in Detroit for the purpose of formulating specific plans and policies and in general to develop a new technique for handling the used car business.

The plan is said to involve control of trade-in prices which means disciplinary action by the factory against chiselers and may lead to publication by the company of its own guide book for used car prices. This action is in line with General Motors' policy of improving the position of dealers by making possible more profitable retail operations and thereby insuring greater stability of outlets. To this end, the corporation has given considerable study to dealer franchises with the result that it is expected new contracts shortly to be written by all divisions will contain important revisions. Among these revisions the substitution of a 90-day cancellation clause for the 30-day provision incorporated in present contracts is anticipated. In case of cancellation, where leases are involved it is understood to have been agreed that dealers may make claim on the factory for such losses up to half the amount for nine months, provided rentals are reasonable. The factory, it is reported, agrees to take back all unsold new cars of current models, accessories purchased from the division during the preceding six months and all parts on hand for current models and those of the two preceding years.

These are the principal features of the new contract which the corporation is understood to have agreed upon. The various divisions may incorporate details to suit their individual needs.

Civil Service Announces Highway Engineer Tests

The U. S. Civil Service Commission has announced competitive examinations for positions in the Bureau of Public Roads, Department of Agriculture. The positions are: senior highway engineer-economist,

\$4,600 a year; highway engineer-economist, \$3,800 a year; associate highway engineer-economist, \$3,200 a year; and assistant highway engineer-economist, \$2,600 a year. Applications must be on file with the commission not later than Oct. 31, 1935.

GM Publicly Opposes Gas-Tax Diversions

Louisville Newspaper Ads Announce Corporation's Stand on Safety Program

In a series of full-page newspaper advertisements General Motors has publicly recorded its opposition to diversion of gasoline taxes from highway purposes. These advertisements appeared in all Louisville, Ky., papers Monday, Oct. 14, upon the opening of the annual Congress of the National Safety Council in that city.

Signed by Alfred P. Sloan, Jr., president of the corporation, the advertisements were headed "Where General Motors Stands on Safety." They called attention to the many safety devices engineered into GM cars as well as the tax diversion problem. Relative to gasoline tax diversion the advertisement stated:

"We place ourselves, also, squarely behind the efforts of far-sighted public officials to discourage the diversion of the gas-tax highway funds—for the plain fact is that under such diversion the highway improvement program has not been able to keep pace with the progress in car engineering."

One of the features of the public safety exhibit at the convention was a Buick sedan equipped with automatic apparatus illustrating the safety devices which are built into all GM cars.

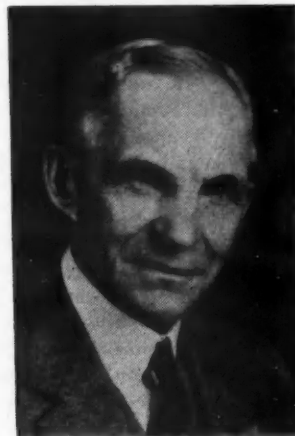
Gillette of G.E. to Address American Welding Society

The first meeting of the American Welding Society in Detroit to be held Oct. 24 will feature a paper on resistance welding of stainless steel with time control by R. T. Gillette of General Electric Co. Joseph Geschelin, Detroit Technical Editor, *Automotive Industries*, will be toastmaster.

Harvester to Modernize Steel Plant in Chicago

About \$2,250,000 will be spent to modernize the International Harvester Company's Wisconsin Steel Works in South Chicago, according to C. F. Biggert, vice-president. \$2,000,000 will be used for modernizing the No. 2 merchant mill, and \$250,000 for installing a new turbo blower. The object is improvement of production equipment and better operating methods.

"—all others will be ejected"



Henry Ford

Non-medical gate crashers at an exhibit for the Interstate Post-graduate Medical Association of America held this week in Detroit's Masonic Temple were greeted with a sign warning them the display was for medical men only and that "all others will be ejected."

But that didn't apply to Henry Ford. He was escorted before the delegates and introduced by famous Dr. William H. Mayo, association president. Neither did Mr. Ford go before the physicians as an outsider—he is an honorary member of the organization.

Some years ago, in company with the late Thomas A. Edison, Mr. Ford entered this exclusive society as honorary member because he had "taken the country doctor through the mud" and later "took the whole medical profession out of the mud" by his advocacy of hard roads.

Hupp New Tool, Die Bill \$220,000 Zweiner States

Hupp Motor Car Corp. has bought \$220,000 worth of new tools and dies for 1936 cars and has paid \$145,000 on them, Wallace Zweiner, treasurer, testified at hearings before Federal Judge Arthur J. Tuttle, in the suit brought by J. Walter Drake against Archie M. Andrews. Mr. Zweiner also testified that the corporation had paid \$332,000 on \$400,000 of notes and other debts which existed last April when the new management took control. It was brought out in his testimony that the corporation needs \$500,000 additional working capital and could get it if litigation were out of the way.

Auburn Promotes Harding

John Tainsh, sales manager of Auburn, has announced the appointment of Sam V. Harding to the position of assistant sales manager. He joined the Auburn sales department in February, 1934. For the last year he has had direct supervision of Auburn's district sales managers.

Steel Looks to Motor Demand for Big Volume

Specifications, Shipping Orders Continue at Even Rate; Expect Tonnage Gain

Whether or not there will be any marked change in the steel market's activities over the remainder of the year depends entirely upon the rate at which automotive demand will make itself felt. Compared with the poor showing of last year and of the preceding year, other steel consuming industries of late have given a better account of themselves, but seasonal tapering off of most of these, especially of the building industry, leaves the market almost wholly dependent upon automotive commitments, which are expected to absorb close to one-fourth of the total, when the year's statistical record is made up.

Specifications and shipping orders for flat steels are coming through this week at very much the same rate as last week, but steel sellers are hopeful that the momentum of new model production is gaining and that moderate enhancement of tonnages to be called for in the next few weeks may be confidently expected.

The American Iron and Steel Institute reports this week's ingot capacity in operation at 50.4 per cent, compared with 49.7 per cent a week ago. Finishing mills in all districts are either holding their own or doing slightly better than last week, this being especially the case in the Youngstown district. Detroit finishing mills, catering to automotive requirements, are working to the fullest extent of their mechanical and man power. Recent advances in the price of forging billets have had little effect on buying by drop forgers. Makers of cold finished steel bars are for the most part completing shipments against orders placed previous to the going into effect of higher extras. Sheet and strip buying is entirely unchanged in extent or character. Inquiry for bolts and nuts is somewhat more active.

Automotive alloy steels continue to be a major item of activity. Although higher freight and insurance rates would make the landed price of certain ores, especially so of manganese, undoubtedly higher, the Italian-Ethiopian clash so far has not had any effect on the steel market.

Pig Iron—Automotive foundries continue to figure prominently as buyers, although single and two carload orders predominate. Slight advances in the wage scale of bituminous coal miners have increased production costs of Western Pennsylvania blast furnaces by about 15 cents a ton, but this, it is stated, will be absorbed by the sellers, and no nearly advance is looked for.

Aluminum—Due to the scarcity of scrap, secondary aluminum producers have advanced their prices for certain alloys to levels higher than those named by the primary producers. The market is firm and tending upwards.

Copper—To the great surprise of the market, domestic demand at the recently announced price advance to 9½ cents has considerably broadened. Immediately following the advance, more than 1,200 tons were sold on one day. With foreign buying also well maintained, the prevailing opinion is that the price of copper is destined to reach still higher ground. The copper producers estimate that 1936 requirements of the automobile industry will attain a total of 200,000,000 pounds.

Tin—A veritable famine of spot tin supplies sent the price for Straits at the week's opening to 54 cents, an advance of one cent over the preceding week's close and about five cents higher than a month ago.

Lead—Easier and only moderately active.
Zinc—Steady and quiet.

Colombia Reduces Import Duties on Cars and Trucks

Reduction in import duties of 20 to 25 per cent on passenger cars and of 50 per cent on trucks and buses is conceded by Colombia in the United States-Colombian reciprocal tariff agreement announced last week by Cordell Hull, Secretary of State. The duty on trucks and buses was reduced from 6 per cent to 3 per cent ad valorem, while the duties on passenger cars were reduced from 8 to 6 per cent for cars valued at \$1,000 and less; from 10 to 8 per cent for cars valued at \$1,001 to \$2,000; from 20 to 16 per cent for cars valued at more than \$2,000. All are factory prices. Automobiles imported without bodies come under the foregoing classifications. On finished parts for vehicles a reduction of 40 per cent was made in the duty, from 10 to 6 per cent. The agreement will become effective 30 days after ratification by the Colombian Congress.

Traffic League Asks ICC to Rehear Spotting Case

The National Industrial Traffic League has asked the Interstate Commerce Commission to reopen and rehear a recent case in which it declared unlawful all arrangements between railroads and large industries under which the industries were made an allowance for performing switching and spotting services within their own plants. The League's petition was filed by its attorneys, Walter, Burchmore and Belnap.

The railroad rate structure of the country, the League's petition points out, has been built up from the beginning on the principle that line-haul rates include terminal services. The Commission's decision, it continues, if it becomes the accepted and only lawful practice, will completely revolutionize the entire rate structure and change the country's economic transportation picture.

Sept. Rim Inspections Up

The Tire and Rim Association, Inc., this week reported that it had inspected and approved 1,052,044 rims during September as against a total of 526,472 for the same month in 1934. The Association reported 13,295,816 inspections and approvals for the first nine months of the year. During the corresponding period of 1934 there were 9,928,287 inspections and approvals.

USCC Seeks Industry's Attitude on Legislation

Industrial and commercial organizations throughout the country are being asked to express their attitude toward recent trends in national legislation through a referendum being conducted by the Chamber of Commerce of the United States, the *Washington Review* announces.

A committee of the Chamber has prepared a group of four questions upon this subject, based upon the trends it has found through a study of recent laws. The questions are: 1—Should there be extension of federal jurisdiction in matters of state and local concern? 2—Should the federal government at the present time exercise federal spending power without relation to revenue? 3—Should there be government competition with private enterprise for regulatory or other purposes? 4—Should all grants of authority by Congress to the executive department of the federal government be within clearly defined limits?

California, Idaho Require Permits, Fees for Caravans

California and Idaho have enacted laws prohibiting caravanning of motor vehicles without a permit from the Motor Vehicle Department in the former commonwealth and the Department of Law Enforcement in the latter, according to the National Highway Users Conference in their law digest *Some More Laws*.

The California statute requires that the permit be displayed on the windshield or other prominent place, provides a fee of \$15 for each vehicle and forbids operation of three or more vehicles or groups in a caravan unless a space of 150 feet be maintained between each vehicle. Permits are good only for the trip or trips specified and in no event for a period longer than 90 days.

Idaho's law is much the same except that the fee per vehicle is \$5 and the time limit on permits is 30 days after issuance.

Canadian Motor Inquiry To be Resumed Jan. 7

Inquiry into the automotive industry in Canada by the Canadian Tariff Commission will be resumed in Ottawa, Ont., January 7, 1936. The inquiry has particular reference to the bearing on the industry of customs and excise duties or taxes, the relationship of production of parts to the larger industry, principles and operations of drawbacks for domestic consumption, matters as to content and cost of distribution and prices at which motor vehicles shall be sold at retail in Canada. The briefs must be in October 29.

The gasoline inquiry will be resumed by the Canadian Tariff Board in Ottawa, Ont., November 18, George H. Sedgewick, chairman, has announced. The inquiry as to whether the tariff on gasoline and other derivatives of petroleum is too high was started last summer on application from the executive of the Co-operative Trading Association of Saskatchewan, Regina. It

was discontinued during the Federal election campaign after evidence had been taken in various parts of the country. All briefs must be in the hands of the board October 29.

Chevrolet Moves Addison

C. A. Addison, head of the plant protective service for Chevrolet Motor Co. in Flint, has been appointed assistant to Alfred Marshall, director of personnel for all Chevrolet plants, with offices in the Chevrolet headquarters building in Detroit. Mr. Addison has a long record in public safety education and organization. He was the organizer of the first schoolboy patrols in Genesee county while he was safety director for the Flint police department in 1927.

Trade Assn. Managers to Meet Nov. 3

The Association of Automotive Trade Association Managers is planning a meeting to be held Sunday morning, Nov. 3, at the Hotel Commodore in New York.

Plymouth Calls More Men

The Los Angeles assembly plant of Plymouth Motors recalled 800 men this week, making a total of 1,200 men at work as normal operations were resumed.

Report Factory-Dealer '36 Contracts Liberalized

Factory-dealer contracts for 1936 of some car manufacturers contain more liberal provisions than similar agreements of past years, the October *NADA Bulletin* says dealer reports to the association indicate. Announcement of these reported liberalizations was made by F. W. A. Vesper, NADA president, at the recent meeting of the association directorate.

Dealers, according to the *Bulletin*, who either have seen some of the new contracts or have received their information from sources they believe reliable, state they provide a 90-day cancellation notice clause; an agreement to repurchase all new cars in stock upon contract cancellation, and an agreement to repurchase special equipment and parts installed in the preceding two years.

Ryerson Plant Addition Completed in Jersey City

Joseph T. Ryerson & Son, Inc., recently completed a new extensive addition to their Jersey City plant, making available an additional 45,000 square feet of floor space for the stocking of steel and allied lines.

The new warehouse, a two-story brick building, is heated throughout and has the latest equipment for the storing and handling of the finer steel products. Special

racks keep the material in good condition and permit quick and easy selection of any grade or size. The heating system holds the temperature at a uniform degree preventing any condensation of moisture or sudden change that would affect the quality and finish of special steels.

Reo Third Quarter Shows Profit; New Cars Under Way

With a profit showing in the past quarter Reo Motor Co. begins its 1936 season in excellent financial position according to Don E. Bates, president. Reo went into production of its 1936 line the second week in October, the earliest date in recent years.

Universal Credit Opens New Office in Nashville

Universal Credit Co., handling Ford credit sales exclusively, announces the opening of a new office at Nashville, Tenn. C. T. Calkins will be in charge of the office, which is located in the Medical Arts Building.

Battery Company Sold

Judge Nat C. Cureton, sitting in Louisville, Ky., referee in bankruptcy, has announced sale of assets of the Red Cap Battery Company to Harry Marks for \$7,100.

"Boss" Kettering enjoys a bite.



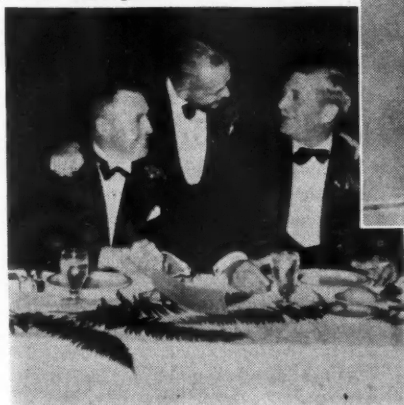
Mr. Swope (back to camera) tells Mr. Ford about his new electric furnaces



H. J. Klingler relaxes from strain of launching new models



W. F. Hufstader, Buick's general sales manager, acknowledges some of his company's \$25,000,000 worth of orders for 1936 cars



J. C. Chick (center) Cadillac's sales manager, shares a story with W. S. Knudsen (right), GM executive vice-president, and Nicholas Dreystadt (left), Cadillac general manager

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

Wholesale and retail business continued to improve last week. Retail trade was particularly good and ranged from 5 to 15 per cent above that during the preceding week. Wholesale reordering was the heaviest this year, and the volume of Christmas orders was considerably above that at the corresponding time last year.

Big Carloading Increase

Railway freight loadings during the week ended October 5 totaled 706,877 cars, which marks a gain of 76,106 cars above those during the preceding week, an increase of 74,471 cars above those a year ago, and a rise of 44,504 cars above those two years ago.

Current Production at New High

Production of electricity by the electric light and power industry in the United States during the week ended October 5 was 12.3 per cent above that

in the corresponding period last year. The current figure is the highest reached since these figures have been compiled.

Department Store Sales Up

According to the Board of Governors of the Federal Reserve System, department store sales during September increased by more than the usual seasonal amount. The adjusted index for that month stood at 82, based on the 1923-25 average as 100, as against 79 for August. The dollar volume of sales was 8 per cent above that in the corresponding period last year.

now available will serve not only to ease the seasonal employment problem, but also to prevent car shortages or delayed deliveries.

Every one of Chevrolet's ten assembly plants, situated at ten cities that serve as distribution centers to supply 10,000 car dealers, shared in the company's improvement program. Two major projects common to all ten plants were the installation in each of costly equipment for a newly developed cromodizing system of treating sheet metal to prevent rust, and for an elaborate system of recirculating lacquer and enamel, which is continuously pumped from the mixing tanks through a circuit of conduits serving all the spray booths and dipping tanks with a constant supply of material.

New Model Orders Near Record

(Continued from Page 499)

for immediate shipment of some 3000 cars and trucks. Pontiac is turning out more than 625 cars daily and will have 12,000 in the field by announcement time. Oldsmobile is shipping 750 cars daily.

Current retail sales have been curtailed materially by lack of cars in the field so that October's sales volume will be no criterion of the demand that exists in most instances—and it is true for the industry as a whole. Sales are running under the level of a year ago, although the potential demand from all indications is higher. Many dealers have absolutely no new vehicles in stock. It will be impossible to gage the actual retail demand until adequate stocks have been built up and this may take another 60 days.

Dr. McClintock's Talk

(Continued from Page 500)

whether the operator was criminally negligent in maintaining his vehicle up to certain approved minimum standards."

Discussing speed as a safety factor the speaker said "speed is, and always has been, dangerous. . . . The fact that a motor vehicle possesses a capacity for speed does not per se make it dangerous. The factor of speed becomes a contributing cause to the severity of an accident when it takes place not in a vacuum but under conditions where conflicts are potential."

Dr. McClintock said that most constructive workers in the safety field recognize that we are dealing with a situation which must be solved in a rational manner and that the ideal end is to attain maximum benefits from the use of the motor vehicle, including its quality of speed.

Touching upon the question of compulsory governors on cars and trucks, Dr. McClintock said it could be concluded that this method of approaching the speed problem is neither in line with the history of mechanical development, nor is it one which is likely to solve any substantial portion of our highway accident situation.

Taking up the basic cause of traffic accidents the speaker said the problem might be compressed into a single statement somewhat as follows: All traffic accidents are the result of the failure or inability of an operator or an individual to so position himself or his vehicle in respect to time or space, that it will avoid conflict with any other vehicle or person.

Traffic accidents, Dr. McClintock said, could be divided into four basic types—medial conflict, marginal conflict, internal stream conflict and intersectional conflict.

Chevrolet Increases Output Capacities

(Continued from Page 499)

Production is increasing daily, Mr. Coyle said, and the company will have built an ample supply of the new models to stock its 10,000 dealers with the 1936 cars before their introduction early next month, and to insure immediate delivery to purchasers on or after announcement day. Increased schedules have been set for November and December, in order to replenish dealers' stocks as rapidly as is necessary to provide for quick deliveries to purchasers.

While the great part of Chevrolet's expenditure of \$25,000,000 was to attain increased capacity in preparation for an expected increase in demand during the coming year, Mr. Coyle declared that during the current year the company had carried out a comprehensive program of construction at assembly plants for the purpose of equalizing employment. This has been accomplished by providing greatly enlarged storage space at the plants, to receive and hold manufactured units till they are needed in assembly.

With the new storage facilities, plants will be enabled to spread their production more evenly over the year, building up the stock of stored parts during months that normally are regarded as slack production periods, and drawing on these reserve stocks during peak production periods. Thus, during the coming winter, it is expected that regular employment will run higher than heretofore, since the manufacturing plants will be creating parts and units that may be drawn upon during the annual spring peak season. The storage capacity increase

Ford Raises Prices on Six New Models

The Ford Motor Co.'s announced prices on its 1936 line of cars for the United States and Canada are:

Model	U. S. 1936	Canada 1936	U. S. 1935	U. S. Change
Deluxe Phaeton	\$590	\$735	\$580	+\$10
Deluxe Roadster	560	725	550	+10
Deluxe 3 Window Coupe	570	725	570	Same
5 Window Coupe	510	665	495	+15
Deluxe 5 Window Coupe	555	710	560	—5
Cabriolet	625	815	625	Same
Tudor Sedan	520	675	510	+10
Deluxe Tudor Sedan	565	None	575	—10
Tudor Tour. Sedan	590	750	595	—5
Fordor Sedan	590	755	575	+15
Deluxe Fordor Sedan	625	None	635	—10
Fordor Tour. Sedan	650	830	655	—5
Conv. Sedan	760	None	750	+10

Ford 1936 Truck Prices

Prices on the 1936 truck line have been announced by the Ford Motor Co. They are:

	1936 Price	Change
112-in. chassis with cab	\$450	—\$5
131-in. stake truck	670	—5
131-in. platform truck	645	—5
131-in. panel truck	765	+5
157-in. chassis and cab	615	—5
157-in. stake truck	730	—5
157-in. platform truck	685	—5

Other models remain unchanged from 1935 prices.

ATA to Employ Cost Plus Basis for Filing Rate, Tariffs Under Carrier Act

Concluding their convention on Wednesday with a hold-over session for a discussion of plans of equitable establishment of rates and tariffs under Interstate Commerce Commission regulation, the American Trucking Association made ready to endorse a basic system of cost plus computations. Speakers representing the trucking industry, shippers and several traffic bureaus alike urged the trucking interests to proceed with the greatest of care and to avoid the pitfalls and mistakes which have complicated railroad tariffs.

Explaining the Motor Carrier Act in detail at the opening meeting on Monday, Joseph B. Eastman, Federal Coordinator of Transportation, set at ease any thoughts of the industry that the Commission planned to assume an arbitrary attitude on any matter.

"The trucking interests will have to decide what rates and tariffs they are going to charge and under what principles they want to conduct their affairs," Mr. Eastman said. "It shall be the purpose of the Commerce Commission to see that they follow the dictates of their own makings."

The election of officers saw Ted V. Rodgers, Scranton, Pa., named to serve his third term as president.

Other officers elected were: treasurer, John F. Winchester, Newark, N. J.; secretary, Walter W. Belson, Milwaukee, Wis.; first vice-president, John W. Blood, Wichita, Kans.; second vice-president, Percy F. Arnold, Providence, R. I.; third vice-president, Hugh E. Sheridan, New York City; fourth vice-president, W. L. Stoghill, Louisville, Ky.; regional vice-presidents, Harry E. Boyesen, Philadelphia; H. D. Horton, Charlotte, N. C.; William C. Winkler, Chicago; Fisher G. Dorsey, Houston, Texas; E. A. Ward, Fargo, N. D.; J. F. Rowan, Denver; C. S. Reynolds, Tacoma, Wash.; B. F. Morris, San Francisco.

Motor Labor Earnings Rise 28% in 10 Mos.

Preliminary Study of "Real Income" Shows Level Near '29 Mark

Automobile factory workers this year have scored important gains in earnings and employment, sharing in the industry's strong recovery from depression.

It is estimated that in terms of "real income," or purchasing power this will at least equal the individual earnings of 1929.

Figures for the first 10 months of the 1935-model production season, compared with a similar period for 1934, show average earnings of individual automobile workers increased 28 per cent while whole-

sale sales of cars and trucks increased just 26 per cent during the same time.

In view of the unusually well sustained demand for cars during the close of the 1935 season, an even greater percentage improvement in individual earnings is expected for the entire production year.

A primary cause of this improvement for the individual worker has been a big increase in the proportion of jobs lasting the best part of the year, made possible by eliminating most of the temporary employment which characterized the industry in 1934. It is estimated that not more than 10 per cent of the employees on the rolls in 1935 have been temporary or part-time workers.

Several outstanding features of the first ten months of the 1935-model production season, developed from the preliminary calculations, are:

1. Marked increase in continuity of employment for the individual worker, resulting in an increase of three weeks work for the average employee (including temporary workers) during this period.
2. Average hourly wage rate at a new high of 73.7 cents, compared to 69.6 cents the previous year. Average weekly hours simultaneously increased to 37 from 34 the previous year.
3. A ten per cent increase in average monthly employment, without increase in the grand total number of men given work during the year, a further evidence of increase of stability.

4. A decrease of more than one-third in the proportion of men laid off, discharged, or who quit during the year.

5. A substantial decrease in the month to month variation in the employment of the industry. Since there was no corresponding stabilization in the demand for cars at wholesale, this greater labor stability is due almost entirely to more careful planning of employment and production.

6. Total payroll disbursements for the ten month period were \$378,802,000, which is 26.7 per cent higher than the payrolls of the first ten months of 1934 production.

7. The 28 per cent increase in average individual earnings occurred during a period when cost of living in automobile manufacturing cities rose only six per cent, representing a net gain of roughly twenty per cent in the employees' real incomes or purchasing power.

8. A 25 per cent decline in the frequency and severity of industrial accidents.

The production year figures cited do not show parallel calendar months, but take for the start of each production year the month of lowest employment when a majority of plants are being equipped to turn out new models. Since the 1935 production season got under way about a month earlier than did the 1934 season, the result would have been distorted if a parallel calendar month basis had been used, and would have slightly exaggerated the improvement in the industry from 1934 to 1935.

It should be noted that in making the above calculations on the average earnings of the workers, employees moving from one company to another have been counted at each place of employment. Thus one man working in three plants during the 10 months is counted necessarily as three men, each working one third of the time. As a result, the averages given here per employee are lower than they would have been if it were possible to follow each man's actual employment and earnings throughout the year.

AUTOMOBILE LABOR CONDITIONS First 10 Months of the 1934 and 1935 Production Years*

Computed from Plant Reports	1934	1935	Per cent Increase
Avg. No. Employees	293,983	323,237	10.0
Employment during Peak Month	370,389	385,190	4.0
Total Payroll (Thous. \$)	298,931	378,802	26.7
Total Hours Worked (Thous. Hrs.)	429,443	513,928	19.7
Production, Cars & Trucks (Thous. Vehicles)	2,355	2,968	26.0
Avg. Earnings Per Week Worked (\$)	23.5	27.2	15.6
Avg. Hourly Earned Rate (¢)	69.6	73.7	5.9
Avg. Hours Per Avg. Employee	1,460.8	1,589.9	8.8
Avg. Hours Per Week Worked	33.8	36.9	9.2

Estimated from Plant Reports			
Number who were employed any time†	425,000	420,000	d 1
Avg. Weekly earnings per emp. on roll any time (\$)	16.3	20.8	28

Labor Turnover			Per cent Decrease
Compiled by U. S. Bureau of Labor Statistics			
Quits (Avg. monthly turnover rate§)	2.0	1.1	43
Discharges (Avg. monthly turnover rate§)	.4	.2	50
Lay-offs (Avg. monthly turnover rate§)	4.9	3.0	40
All Separations (Avg. monthly turnover rate§)	7.3	4.3	41

* Production years begin with month of lowest employment, therefore, 1934 figures shown are for the period from November, 1933 to August, 1934, and 1935 figures are for October, 1934 to July, 1935, both inclusive.

† A.M.A. data covers all significant automobile and body plants except small, independent truck body producers. Parts plants are excluded. B.L.S. data refer to the automobile industry excluding parts plants. They comprehend both automobile factories proper and some body operations. Although not as complete as the A.M.A. data they provide the best available information on turnover in the industry and reflect fairly the aggregate condition.

‡ Estimated number employed at any time during period equals peak month employment plus quits, discharges and deaths prior to and including peak month plus one-third accessions after peak month. Turnover estimated by multiplying each month's average employment by Bureau of Labor Statistics turnover ratios for auto industry proper. Other estimated figures are derived directly from the estimated number who were on the roll at any time during the period taken in conjunction with actual average employment and total payroll figures.

§ Turnover per hundred employees on roll each month.

Industry Congress to Hear Sloan on Current Problems

Alfred P. Sloan, Jr., president of General Motors, and E. T. Weir, chairman of the National Steel Corporation, will be among the leaders of industrial thought who will speak at the annual Congress of American Industry to be held in conjunction with the convention of the National Association of Manufacturers in New York City December 4 and 5.

The annual meetings will be held this year at the Commodore Hotel and will be preceded by a two-day meeting of the National Industrial Council, composed of State, local and trade groups affiliated with the National Association of Manufacturers. C. L. Bardo, president of the association, and Robert L. Lund, chairman of the Board, will preside over the sessions at which industry will formulate its views just prior to the session of Congress which will convene three weeks later.

Other speakers on the program include Dr. Virgil Jordan, president of the National Industrial Conference Board; Dr. Neil Carothers, dean of the College of Business Administration, Lehigh University, and James A. Emery, general counsel of the association. In addition, Charles R. Hook, president of the American Rolling Mill Company; W. B. Bell, president of the American Cyanamid Company, and James W. Hook, president of the Geometric Tool Company, will lead discussions upon the various national problems confronting industry. James W. Hook, chairman of the Committee on Government Relation to Industry, will present the report of the committee which is now meeting to formulate industry's policy upon this vital question.

Because of the proximity of the session of Congress, at which introduction of legislation to supplant the N.I.R.A. and other measures deeply affecting industry has been forecast, this gathering of manufacturers to obtain a cross-section of industrial views is expected again to draw a thousand or more executives of large and small plants.

Schulman Fender Patent Held Invalid by U.S. Court

The Schulman front fender design patent has been held invalid by decision of the United States District Court in New York in a test case brought by Joseph Schulman, the inventor-patentee, against Graham Motors, Inc. The case involved alleged infringement of deep-flanged front fenders, but the defendant was able to prove lack of originality by producing two illustrations, dating as far back as 1918, of similarly designed fenders.

Social Security Taxes Not Due Before 1937

While the Social Security Act becomes effective January 1, 1936, no payment of federal taxes required under this law will be necessary before January 1, 1937, according to an announcement of the Chamber of Commerce of the United States in its *Wash-*

ington Review. The first taxes for which employers will be liable, one per cent of payrolls for old-age retirement purposes, begin to accrue with the operation of the Act, though no report is required until the end of the year.

Administration of all sections of the Act has been delayed by the failure of Congress to provide funds for the Social Security Board, administrative agency. Funds for the operation and administration of the Act were scheduled in the Third Deficiency Bill which was defeated in the closing days of the last Congress.

Railroads Reduce Fares For N.Y. Automobile Show

Eastern, western and southern railroads have authorized reduced round-trip fares of one and one-third first class fares for visitors to the New York Automobile Show, Alfred Reeves, show manager, has announced.

These tickets are open to the public without certificates in advance. They are non-transferable and must be validated at New York ticket offices for the return trip. Stop-over privileges are allowed on the home-bound trip but not on the trip to New York. These tickets will bear a return limit date of Nov. 18.

Develop New Tractor Chain

American Chain Company, Inc., Bridgeport, Conn., has developed the Weed Bull tractor chain for use on farm tractors equipped with low-pressure pneumatic tires. These chains are said to be light in weight and can be put on by one man. There is said to be no excessive vibration when it is necessary to run over the roads or hard ground with the chains on.

Tapscott NIAA Director

Charles C. Tapscott, advertising manager of the McQuay-Norris Manufacturing Co., St. Louis, was elected a director of the National Industrial Advertisers Association at its recent convention in Pittsburgh.

Auburn to Put Safety Stickers on All Cars

Tags on Windshield Part of National Campaign to Educate Drivers, Owners

All Auburn cars shipped from the factory in the future will bear a windshield sticker informing the driver that the car has been thoroughly engineered and tested from a safety standpoint. This campaign is being made at the suggestion of Harold Fowler, First Deputy Commissioner of the Police Department of New York City.

The sticker is to be placed in a prominent spot on the windshield facing the driver, without interfering with vision, and will be a constant reminder to the owner to use care in how he operates the car on the streets and highways.

Roy H. Faulkner, president of Auburn, commenting on the campaign, said:

"We are placing these stickers on all cars shipped from the factory in the hope that it will be a constant reminder to car owners to drive safely. The number of deaths and injuries from automobile accidents convinces us that the automobile factories should unite with the safety councils and police departments throughout the country in a national campaign to promote careful and safe driving. Auburn has spent thousands of dollars in building safer automobiles. Nothing is left undone, either in engineering, building or testing to make our cars safe in the hands of our owners."

Evans Products to Spend \$100,000 on Detroit Plant

Evans Products Co. will add 30,000 square feet of floor space to its lumber products plant in Detroit. The addition, which will cost approximately \$100,000, is for the purpose of providing manufacturing and assembly space for its Auto-Stop and Auto-Railer divisions which report increasing business. The new plant will be equipped with modern machine shop for production and precision work.

CALENDAR OF COMING EVENTS

SHOWS

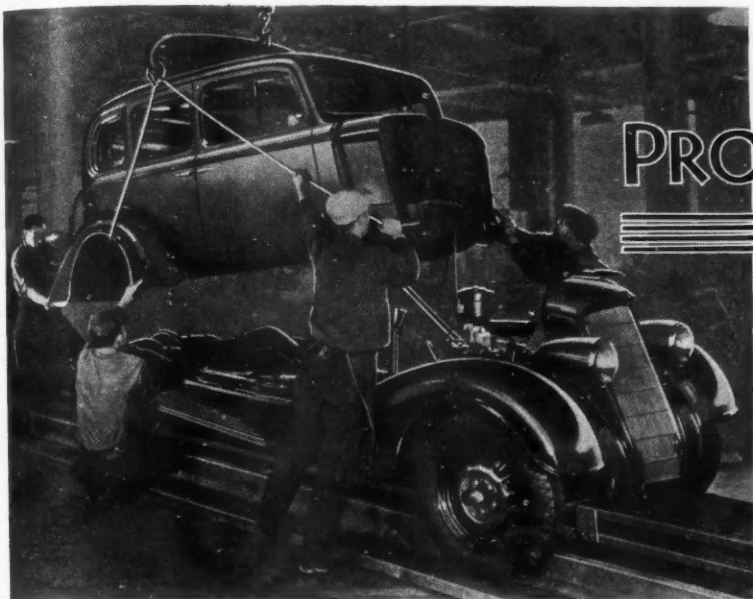
New York Automobile Show, New York, Nov. 2-9
Baltimore Automobile Show Nov. 2-9
San Francisco Automobile Show... Nov. 2-9
Washington, D. C. Automobile Show, Nov. 2-9
Detroit Automobile Show Nov. 9-16
Buffalo Automobile Show Nov. 9-16
Indianapolis Automobile Show.... Nov. 9-16
Newark Automobile Show Nov. 9-16
Cincinnati Automobile Show Nov. 10-16
Pittsburgh Automobile Show.... Nov. 11-16
Philadelphia Automobile Show... Nov. 11-16
Toledo Automobile Show..... Nov. 15-21
Chicago Automobile Show..... Nov. 16-23
Portland, Ore., Automobile Show... Nov. 16-23

Minneapolis Automobile Show.... Nov. 16-23
Columbus Automobile Show Nov. 22-23
Cleveland Automobile Show Nov. 23-30
Montreal Automobile Show Nov. 23-30
Kansas City Automobile Show, Nov. 30-Dec. 6
Milwaukee Automobile Show... Nov. 30-Dec. 6
Automotive Service Industries Show—Atlantic City Dec. 9-13

CONVENTIONS AND MEETINGS

Industrial Materials Exhibit, Hotel Astor, New York Oct. 21-25
S.A.E. Annual Dinner, New York.... Nov. 4
SAE Annual Meeting, Detroit, Jan. 13-17, 1936

PRODUCTION LINES



Duo Metals

Any high alloy steel, including high-speed-steel and stainless steels, capable of being forged can be welded to low alloy steel or mild steel backing with a clean, chemical bond. At least that is the claim made by the Duo Metals Division of Latrobe. The Duo process features an electrolytic treatment which is described in a technical booklet now available to any one interested. Duo metals should be of particular value in large tool die work where only the working elements of the job need be of the more expensive material.

On Alloys

Just received a big handsome limp leather bound handbook on alloy steels by Bethlehem. It is a really comprehensive treatment of the subject in a way that will appeal to metallurgists and designing engineers. Part five is devoted to a glossary of terms used in metallurgical practice, while part six is replete with tables and useful information. Bethlehem is to be congratulated on this outstanding job.

Body Changes

Many, if not all, body jobs for 1936 are hinging the front door at the front pillar. The swing is decidedly in that direction.

Lighter Pistons

Another swing is to lighter pistons. Buick has adopted aluminum pistons

for the first time in its history. One car quite unexpectedly will announce an alloy iron piston—nickel iron—with extremely thin walls, considerably lighter than cast iron. This is not one of the two big producers who were under discussion some time back.

Pin-Splice

Just got wind of a new development in small tools for turning, forming, etc. The tool bit is held in the tool holder with pins or dowels which fit into grooves cut in the tool and holder. This is said to give a positive anchorage and holds the tool in perfect alignment throughout its life span. For sharpening, just the top rake is ground. And thereby it is possible to use the tool bit right down to a thin or pretty thin slice. Want to hear more about it?

Barrel Roller

Watch for a decidedly new roller bearing. It has barrel-shaped rollers and curved races. Under load, the races conform to the roller contour and increase the effective bearing area. This bearing has been adopted by one of the leading car makers. We'll wait for their announcement.

Better Economy

Fuel economy has been the objective of most car builders this year. The new engines have been tuned for better performance and you will find that most announcements will quote

fuel economy figures. Needless to say, that's good news for any prospective car buyer and should help sales.

Rust-Proofed

Cromodizing, the new rust-proofing process developed by American Chemical Paint Co., is gaining acceptance. The first installation was made by Chevrolet at its Baltimore plant. Now we learn that one of the independents has installed the system for 1936 body production.

Very Tricky

One of the independents, outside of the Detroit area, has a new car that incorporates some real novel features. Not the least of these, from what we hear, is a system of disappearing headlamps. For daylight driving, they fold up into the front fenders.

More Features

Hydraulic brakes and turret or steel roofs will predominate on the new cars for 1936. By the looks of it, these features will practically be universal within another year.

Clean Fun

There are two friendly competitors in Detroit handling a specialty that's unique to their business. They are so courteous that neither one will leave town unless the other is leaving, too. The other day, one of them was laid up and the other took in about \$20,000 of new business.

—J. G.

MANUFACTURING
MANAGEMENT
METALLURGY

The Horizons of

The Yellow Flood

FOR over two thousand years legend has garmented the name and personality of King Midas with a yellow aura. The amount of gold which he had was "colossal," "stupendous," "prodigious." No doubt about it, the king had a lot of hard yellow cash. Unfortunately he left no figures. He had no Morgenthau with a staff of ardent publicity men to tell the world how much gold the royal sock held. This is a pity since it would be interesting to see how this pre-Christian miser's golden hoard compared with the yellow cache of that all time champion squanderer, Uncle Sam. Though it may seem strange it is nevertheless a fact that a government which spends more during the four year administration of a single president than it spent in all the administrations from Washington to Taft, inclusive and in the aggregate, nevertheless has accumulated the greatest mass of gold which history records.

Trainloads of Gold

Our Government deals so continuously and so nonchalantly with billions that the citizens who will ultimately foot the bill scarcely grasp the significance of the figures with which Harry Hopkins will put "3,500,000 men to work" or the round sums with

which Tugwell will lift the social face of the land. Much as we deplore the end-to-end type of statistics, this is one occasion where such a device offers a practicable method of translating astronomical quantities into terms which an ordinary fellow can visualize.

Imagine yourself at a railroad crossing. A heavy freight train is laboring by. You count the cars. There are 84. A second train follows. Again 84 cars. Each car holds more basic money, i. e., gold, than the average citizen sees in the course of a life time—\$56,000,000. These two trains carry 43 per cent of the world's monetary gold stocks. All this saffron bullion belongs to Uncle Sam. Lest he cherish any mistaken notions about the financial solidity of the Government which owns these 168 cars of precious metal it is well to add that a carload of gold will cover Uncle Sam's grocery bills, charitable donations and party insurance for a period of 60 hours and 28 minutes. The great wallet on wheels which the wondering citizen has just seen will support the old gentleman—in the manner to which he has recently become accustomed—for approximately one year and two months.

However these are all truant observations, irrelevant *obiter dicta* which have no part in this story. We are concerned here

with the nature of this strange accumulation. In truth it constitutes public monetary mystery No. 1, and for the time being, displaces that other stellar performer inflation.

The Story

Here is the story. The United States is now on what, for want of a better term, we shall describe as the New Deal gold standard. This means that anyone can obtain gold in exchange for money (in a real gold standard country currency is a warehouse receipt for gold) if, as and when the Government pleases. For its own citizens the Government never so pleases. It trusts them with gold no more than it trusts them to raise their own potatoes. The alien, unless he be a particular type of corporate person known as a central bank, receives precisely the same treatment. In other words the domestic owner or producer of gold and the alien holder who ships gold to this country must surrender it to the Treasury and receive in return \$35 in currency per ounce. This is a strictly one way arrangement. It is unpatriotic, illegal and positively capitalistic to expect the Government to redeem its circulating IOU's in authentic hard cash.

The Enigma

The domestic holder of gold, unless he has permission to use it for filling teeth or making jewelry, must surrender it to the

f Business

By Joseph Stagg Lawrence

Treasury on pain of penalties usually meted out to wife beaters, highwaymen and swindlers. He has no choice in the matter. The foreigner who does not have the benefit of New Deal monetary policy is not constrained by these conditions. He may keep his gold at home, reveal it openly and still remain a citizen in good standing. In spite of this apparently comfortable position as compared to the American he has nevertheless decided on a large scale to abandon his privileges at home and send his gold to America. He is sending it here in such quantities as to tax the carrying capacity of the shipping qualified to transport it. During the past year \$1,434,000,000 of the precious metal has been imported by this country. It has come from all parts of the world but largely from three countries in Europe, England, France, and Holland. Even India, which has always been known as the bottomless sink of the precious metals, has disgorged a part of its unmeasured hoard.

What is the answer? Why the trek of yellow metal from all parts of the globe to a land where a strange government immediately sterilizes it and buries it in deep vaults to return only at its own pleasure?

Orthodox Solution

The economist offers an orthodox explanation. Gold, he avers, is the most fluid of all commodities. It responds to value the way

mass responds to gravity. It flows automatically, when not hampered by artificial restrictions, to points of maximum value. When the American Government decided that gold should henceforth be worth \$35 an ounce instead of \$20.67 it gave the yellow metal an entirely new value. Its buying power was raised almost 60 per cent by statute. No corresponding change in its value occurred in other parts of the world. The owner of an ounce of gold contemplating its value in terms of other goods immediately realized that the best place to exchange the yellow metal for other commodities and services was America. Since there were no tariff barriers to surmount and the cost of transportation in relation to value was slight he shipped his gold to the United States.

Following this process to its logical end this shipper takes the dollars received for his gold on this side, converts them into goods and brings these back home. He thus ends up with more for his gold than if he had spent it directly in his own country. Before the war the gold standard unquestionably did operate in some such fashion. There were certain more or less automatic monetary correctives which regulated the flow of the precious metal. Unfortunately this solution does not

fit the present case. If it were a correct solution our export figures would immediately verify it. However our export balance instead of increasing is shrinking which leaves our gold flow problem unsolved.

A Better Solution

The solution offered by first hand students, i. e., those that have some acquaintance with the motives of the shippers is different. It is only necessary to place ourselves in the position of the average European who looks at America. He sees a country disturbed, to be sure, by an abortive, governmentally sponsored economic revolution. Yet by contrast with the social planning and variety of dictatorships to which he has been exposed the New Deal is conservative. The country is young, energetic, rich in resources, equipment and managerial talent. It holds a reasonable prospect of vigorous growth. Above all it is at peace and determined to remain at peace. If you had gold in Europe would not America beckon as an alluring safe haven? The fact is that America looks as attractive to the alien capitalist as it does to the alien worker knocking at our door. We are witnessing capital immigration on a prodigious scale.

Easier Steering, All Pressed Steel Wheels,

FORD V-8 cars for 1936 feature a completely new exterior treatment with new hood and fender styling, new grille and headlamps, new wheels and many detailed refinements. Interiors are also new with the style and color of instrument panel and moldings to harmonize with upholstery, trim and appointments. Mechanical changes contribute to improved steering, gear shifting and overall quiet operation of the car. The V-8 engine is continued without material change, although the capacity and efficiency of the cooling system have been increased.

The top of the grille has been brought forward slightly, decreasing its slope. It is also more pointed. The greater

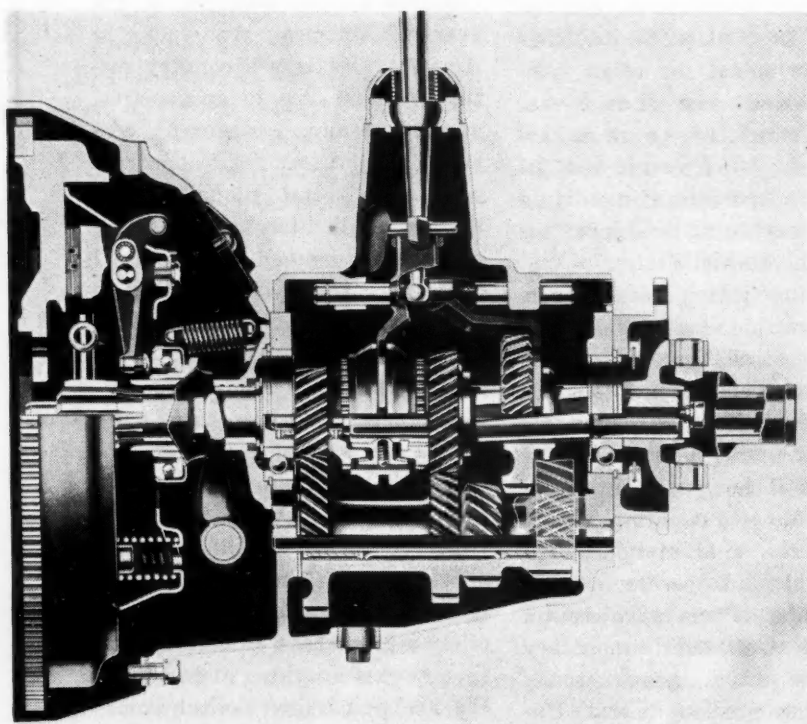
length of the top of the hood makes the car appear longer. New, more closely spaced hood louvres conform in style with the new vertical grille bars, which in deluxe cars are chromium plated, with rustless steel center strip and molding on all cars. Both front and rear fenders are deeper and flow smoothly into the lines of the bodies. In deluxe cars, horns are concealed behind circular chromium-plated grilles set in the forward edges of the front fender flares. In cars without deluxe equipment the grilles are painted the body color. The bottom edge of the grille and fender flares curve under the forward edge of the car, more completely concealing the running gear, and produc-

ing a "streamline" effect. The new pressed steel wheels also serve to conceal the understructure of the car and increase the impression of greater massiveness produced by the new hood and grille.

Several mechanical refinements combine to reduce steering effort approximately 25 per cent. The overall steering ratio has been increased from 15:1 to 17:1. This takes into account an increase of 0.5 in. in the length of the right steering spindle arm to bring the drag-link more nearly parallel with the front axle. The pitman arm shaft is now mounted on straight needle roller bearings, making all those in the steering gear case of the anti-friction type. A new adjustable drag-link makes it possible to set the "high spot" on the steering sector to conform exactly with the straight-ahead position of the front wheels, for convenience in manufacturing and servicing the car. The worm and sector are now lapped.

More silent operation of the transmission is obtained by the use of helical gears for low and reverse speeds as well as for second and high, as in 1935 cars. The synchronizer between second and high gears is retained. The movement of the gearshift lever from neutral into all speeds has been decreased $\frac{5}{8}$ in. by moving the top of the shifter tower forward and modifying the leverage between the gearshift ball and slide bars. Large floating thrust washers for the helical gears greatly increase the available bearing surface.

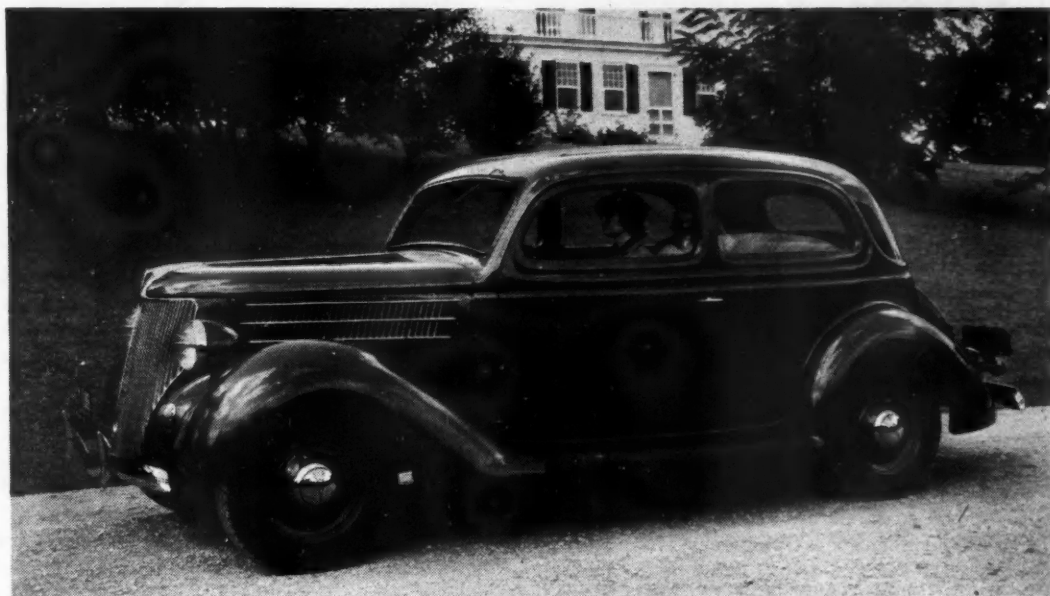
One of the most noticeable features of the 1936 cars is the new cold-pressed steel wheels, which differ from others of somewhat similar appearance by the fact that the center section is welded to the rim at every point where the modified "spokes" meet it. The center or "spoke" section is formed from a steel disc 0.110 in. thick, the bolt circle being so large that the wheel virtually consists of a rim attached to the brake drum. The hub caps are $12\frac{1}{2}$ in. in diameter, with polished centers of rustless steel. The new wheels are compara-



The transmission of the Ford V-8 for 1936 uses quiet helical gears in all forward speeds and reverse. Previously helical gears were used only in second and high speed. The top of the shifter tower has been raised to permit shorter throw of the gear shift lever.

Silent Transmission, s, Feature the New Fords

Wide streamlined front fenders shroud the tires and house the horns behind chromium grilles. New design steel wheels with 12 1/2-inch hub caps are handsome and easy to clean. Bucket-type front seats are exceptionally comfortable

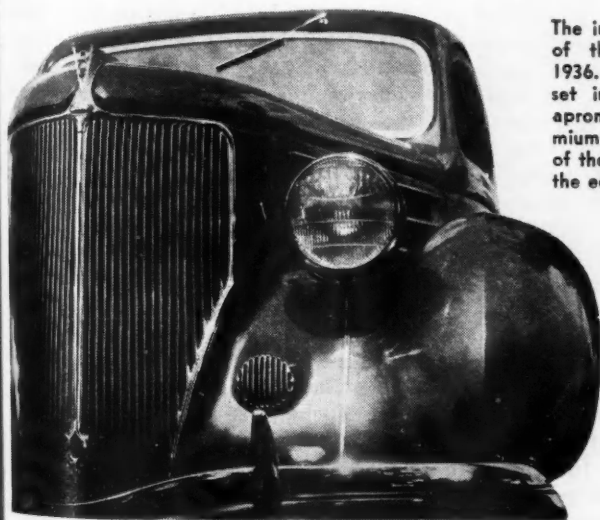


ble in strength with those formerly used and have the additional advantage of being easier to clean. A particular advantage of the new wheels is their reduced weight, almost 5 lb. per wheel, or a 20 lb. reduction in unsprung weight.

The 1936 line of deluxe cars includes 10 body types, three of which are offered also without deluxe appointments. The deluxe convertible sedan introduced during 1935 is continued. The deluxe types also include the three and five-window coupes, roadster and cab-

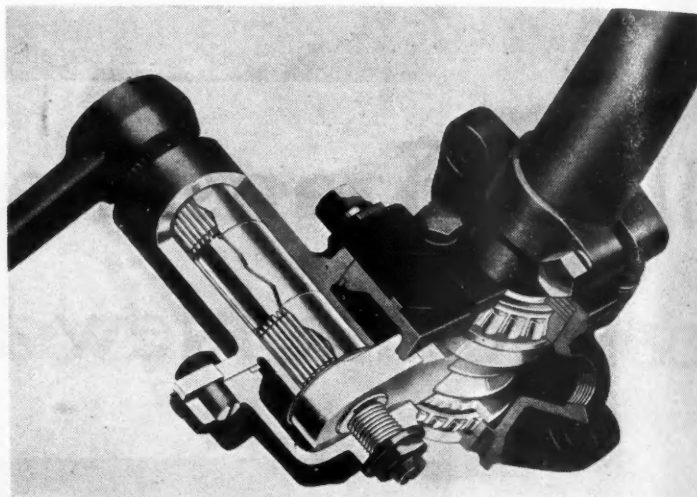
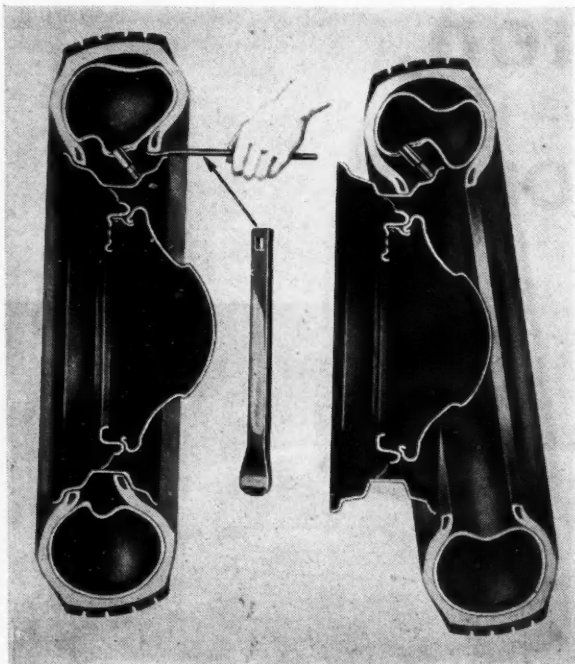
riolet with rumble seat, phaeton, Tudor and Fordor sedans, the latter two also offered in touring types with built-in trunk. Cars without deluxe equipment are the five-window coupe and the Tudor and Fordor sedans. All body dimensions of cars for 1936 are the same as in 1935, except that the elbow width of Fordor sedans has been increased some three inches by inseting the trim closer to the rear quarter panels. This has been made possible through the use of vertically hinged rear quarter windows, thus eliminating the operating mechanism under them and providing the available space. Safety glass is used in the windshield and all windows of all cars. All structural parts of the body are of steel. Door panels are welded to the door frames, floors to the lower sills.

The interior trim and upholstery of all deluxe models are entirely new. Taupe colored mohair and broadcloth are offered for the coupes, with Bedford cord also available in the sedans. The seat cushions and backs in the cabriolet and convertible sedan are in genuine leather or Bedford cord, with leather



The improved front end of the Ford V-8 for 1936. Note the horn set into the fender apron behind a chromium grille and contour of the fender carried to the edge of the radiator grille.

The method of removing the tire from the drop-center rim of the 1936 Ford V-8 car, using the Ford tire tool, is shown. It is necessary first to take off the 12½-inch hub cap, which extends nearly to the rim



The anti-friction bearings in the steering gear case of the Ford V-8 for 1936 are shown in this cutaway view. The two assemblies of needle roller bearings on the sector shaft are new

only for the cushions and backs in the roadster and phaeton. Upholstery and trim for cars without deluxe equipment are a wide wale Bedford cord.

The instrument panels are finished in gray pyroxylin in all cars. This same finish is applied in deluxe types to the gearshift ball, steering wheel and interior hardware, the latter with gray plastic knobs. Instruments now include electric fuel and oil gages and a water-temperature indicator. The oil gage is omitted from cars without deluxe equipment. Deluxe appointments also include two horns, two combination tail-and-stop lights, two swivel sun visors, chrome-plated windshield frame, and foot rest in the Fordor and convertible sedans.

Body colors for 1936 deluxe cars include two new shades, gray vineyard green and Washington blue, in addition to the Cordoba tan, black and gunmetal, with attractive striping used previously. Body colors for cars without deluxe equipment are black and gunmetal, with wheels in black. The wheels and fenders of deluxe cars are finished the same colors as the bodies. All colors are in the baked enamel finish first successfully used by the Ford Motor Company.

Special attention has been given to silencing the body and preventing the entrance of exterior noises. New mate-

rials are applied to the floors, door and body panels and dash, and an improved method of balancing and aligning the driveshaft reduces rear axle noise.

As noted previously, the V-8 engine is continued without noticeable change,

due to its highly satisfactory performance during the past few years. The capacity of the cooling system has been increased from 5 to more than 5.5 gallons, the additional amount being largely carried on the radiator. Louvres under the front fenders and the new hood side louvres improve the rate of flow of air through the engine compartment. Mechanical brakes and other established Ford features remain the same as previously, including the use of transverse springs, front radius rods, and full torque-tube drive, as well as the cast alloy steel crankshaft and precision-set non-adjustable valves.

Centrifugal Type Blower Used on Maybach Diesels

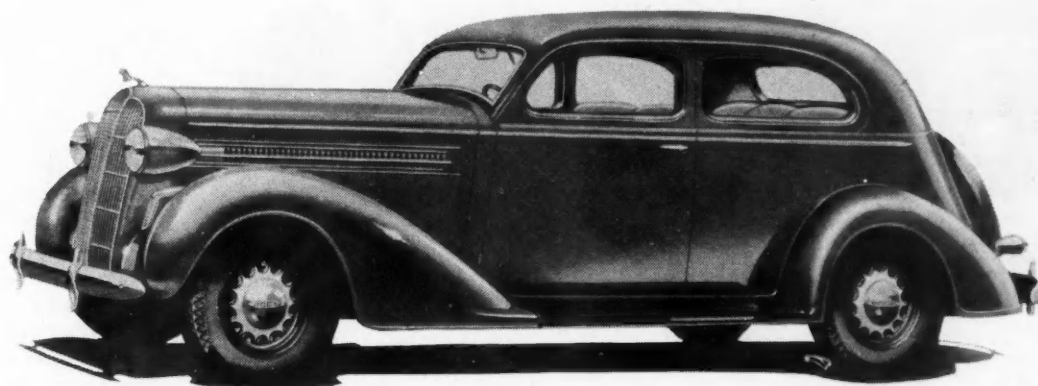
WHEREAS in this country the Roots blower is generally preferred for supercharging large Diesel engines, such as used in railcars and locomotives, abroad the centrifugal blower seems to be meeting with considerable success in this field. Thus we learn from the Buchi Syndicate of Winterthur, Switzerland, which controls the supercharging system developed by Dipl.-Ing. Alfred Buchi, that the Maybach Motor Manufacturing Company of Friedrichshafen, Germany, which built the engines used on the Flying Hamburger train, two-and-one-half years ago, ordered a turbo-supercharging set suitable for use on its 12-cylinder V Diesel engine. This engine normally develops 410 hp. at 1400 r.p.m. in 12 cylinders of 160 mm. bore and 200 mm. stroke (6.30 by 7.88 in.). Equipped with a turbo-supercharger

the normal output is increased to 600 hp. at 1400 r.p.m., while the maximum output obtained on the test stand was 730 hp. at 1400 r.p.m. Without supercharging the specific fuel consumption was 0.418 lb. per b. hp.-hr., and when supercharging it was reduced to 0.374 lb. per b. hp.-hr.

As a result of the satisfactory operation of the supercharger bought two years ago, the Maybach Works recently bought twelve supercharging sets for use on six Diesel locomotives for use on the German State railways. The engines will be rated at 600 hp.

The Buchi Syndicate is composed of Mr. Buchi, the Swiss Locomotive Works of Winterthur, and the Brown-Boveri Company of Baden, Switzerland. The turbo-superchargers are being manufactured in the Brown-Boveri plant.

New Hood and Fender Treatment Marks the 1936 Dodge Line



Dodge 1936 2-door Sedan model, with spare wheel mounted in the rear. The front seat extends the full width of the body and both sections of the back cushion may be tilted

NEW, modernistic styling features the Dodge 1936 line, which consists of seven body styles all on the same six-cylinder chassis, which carries the same 87 hp. engine as last year. The bodies are a four-door sedan, four-door touring sedan, two-door sedan, two-door touring sedan, coupe, coupe with rumble seat, and convertible coupe.

As may be seen from the illustrations herewith, the front-end appearance has been considerably improved. There are new hood lines, fender contours, catwalks which bridge the fenders and hood and carry the horn grilles in which the radiator pattern is repeated in miniature, and an "air-lined" windshield, the lower corners of which are made to follow the cowl lines. Body sides, rear panels and roof also have been refined. Among mechanical features may be mentioned improvements in the spring suspension, steering linkage, ride levelator and the X-type frame which latter has been strengthened. Refinements have been made also in the floating-power engine mounting.

The ride levelator, which consists of a steel bar extending across the frame with its ends bent at right angles, now is directly secured to the shock absorber arms instead of having separate link connections to the axle. It is unobtrusively located behind the radiator grille and is said to require no adjust-

ments throughout the life of the car.

The front springs are shackled at their front ends, and the rear end of the spring on the left side rests in a "kick shackle." The arrangement is such that the front axle and the forward end of the steering drag link move through arcs of equal radii. This, in conjunction with the kick shackle at the rear end of the left front spring, prevents interference between the sus-

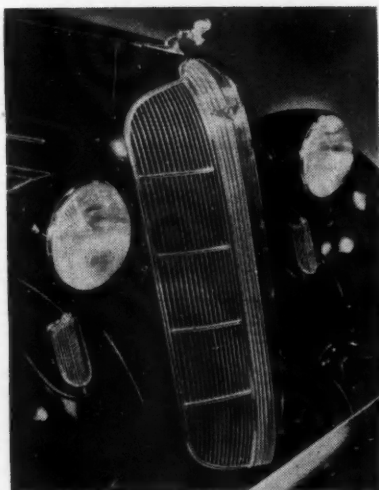
pension and the steering mechanism.

For road illumination the headlamps supply a main beam for open road travel and a courtesy or passing beam. Both beams are of equal intensity—from 32-c.p. bulbs—but while the main beam is directed straight ahead, the passing beam is directed toward the ground and toward the right side of the road, where it clearly outlines the shoulder or edge of the road. Masked bulbs cut off the otherwise scattered rays which produce a thick haze in front of the car in foggy weather. A dash switch controls the off, parking and headlight positions, while the change from the main driving to the passing beam, and vice versa, is made by means of a foot switch.

Another innovation consists of a small red jewel set into the control button of the headlight switch on the instrument panel. Because it is illuminated when the main driving beam is on, the jewel keeps the operator informed as to which of the two beams is in operation at any time.

Instrument lighting, which is indirect and can be set at "off," "low" or "full," can not be turned on unless there is some form of head and tail-lighting. Yet, the instrument lights can be turned off alone, without extinguishing the head and tail-lights. The instrument lights go "off," however,

(Turn to page 519, please)



This front view of the 1936 Dodge shows the new lines of the radiator grille, hood lines, and fender contours. Note the horn grilles in which the main radiator pattern is repeated



Nineteen Body

by Joseph Geschelin
Detroit Technical Editor

The 1936 Pontiac
straight eight two-
door sedan

FOR 1936, Pontiac offers a line of three models—the straight eight, a six, and a deluxe six in 19 body styles. The straight eight and deluxe six are available in six body styles, while seven are mounted on the six chassis. Common to all lines are two-door and four-door sedans; two-door and four-door touring sedans (with built-in trunk), all accommodating five passengers; the standard coupe for two passengers, and the sport coupe for four passengers. A four-passenger cabriolet is also available on the six chassis. Many optional features are offered, with a wide variety of finishes and trims recently developed by Duco. Safety plate glass all around is now standard equipment at slight extra cost.

Probably the most striking change in external appearance is in the front-end treatment, where the chromium grille has been crowned as it sweeps up over the radiator in an unbroken line, emphasizing speed and giving the impression of a longer, and lower car, despite the unchanged wheelbases of 117 in. on the eight and 112 on the sixes.

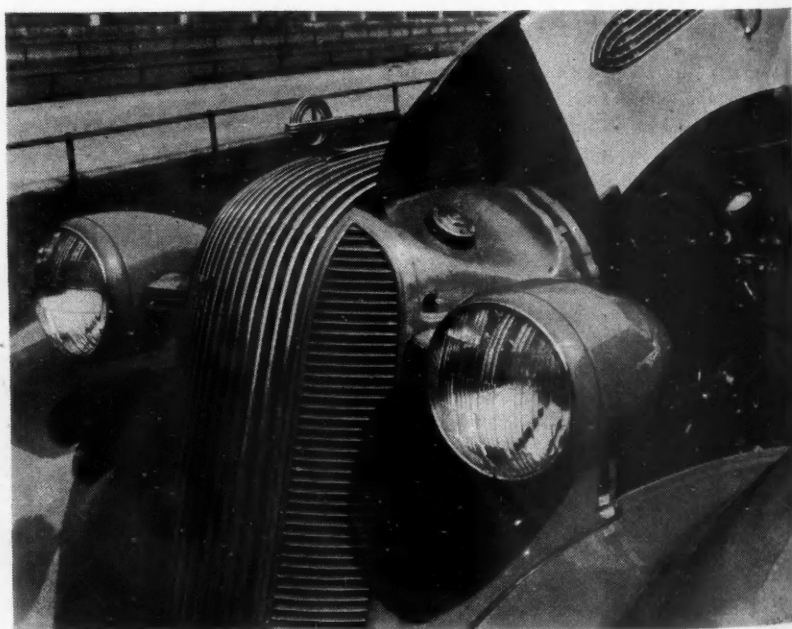
General improvements in all models include a new front-end and fender design, all-rubber steel-reinforced running boards, colors and upholstery, instrument panel and instruments, larger steering wheel, longer seat cushions, new synchro-mesh transmission silent in all forward speeds and reverse, rust-proof sheet metal, reduced oil consumption, and a more rigid frame for greater body stability and safety. Bendix hydraulic duo-servo brakes are continued.

The cylinder bore of the eight has been increased from $3\frac{3}{16}$ to $3\frac{1}{4}$ in., the stroke remaining the same at $3\frac{1}{2}$ in., which makes the piston displacement 232 cu. in. The engine is rated at 87 hp. at 3800 r.p.m. Other engine features of both the sixes and the eight are continued.

On the six-cylinder engine, which is identical on the six and deluxe six lines, better charge distribution has been obtained by enlarging both outside branches of the intake manifold, thus

reducing the velocity of the charge on its way to the first and sixth cylinders and giving better, more nearly uniform distribution to all cylinders. There are dams across the bottom of the two main branches, high enough to keep vaporized liquid fuel from entering any of the cylinders. The smoothness of the engine has been increased by a redesign of the combustion chamber to eliminate over-running or firing after ignition is cut.

Mechanical improvements on the six and deluxe six include an automatic choke, an automatic throttle opener which makes starting more nearly automatic, a new intake manifold, a new



The new Pontiacs present a new front. The water filler pipes are more conveniently located

Styles on Three Models

Make Up New Pontiac Line

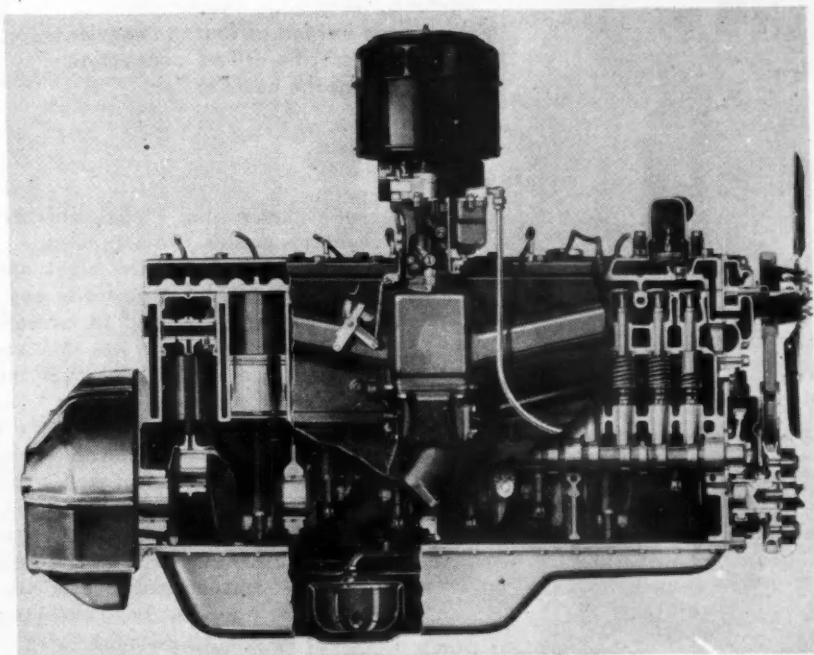
All-silent-gear transmission, increased cylinder bore, larger steering wheel and longer seat cushions among the 1936 new features

combustion chamber on the eight and deluxe six, and front-wheel balancers. All of the models show better oil economy and have a new clutch driven plate, a new all-helical gear, a synchro-mesh transmission, composition steel-web, cast iron rim brake drums, and moulded linings.

Pistons are of a nickel-iron alloy which permits of thinner walls. Skirts are shorter because of the improved oiling and cooling. The pistons of the eight-cylinder engine are shortened $3/16$ in.; those of the six-cylinder, $1/8$ in. Connecting rods are 30 per cent stronger, but the increase in their weight is compensated for by the reduction in piston weight, so that the reciprocating weights are not changed. Connecting-rod bearing surfaces have been increased 7 per cent by eliminating the oil groove in the lower bearing.

The use of full-length jackets reduces the oil temperature at high speeds by as much as 45 deg. An improved oil trap on the crankcase breather turns the ventilating current through an angle of 180 deg., thereby throwing off any entrained oil and permitting of better ventilation without loss of oil.

Solid steel turret top now features the bodies by Fisher which also have luxurious fittings and improved styling of interiors. Front doors on all models are hinged at the front pillars. Optional upholstery is offered on all three lines. The six may be had in taupe mohair or brown pattern broadcloth; the deluxe six in taupe mohair or modified tweed pattern taupe woolen cloth, and eight in taupe mohair or brown pin stripe broadcloth. Cabriolets are trimmed in hand-buffed, crushed-grain tan Spanish leather or taupe worsted Bedford cord.



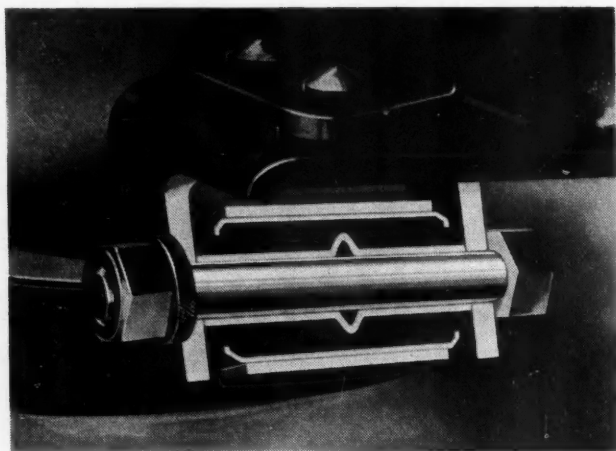
Cross section of the 1936 Pontiac straight eight engine

The instrument panel is finished in burled poplar and chrome, with Tenite control knobs and instruments done in the ultra modern mode. Lighting is improved by the adoption of radio dial-type lights. Better balance of the panel is achieved by inserting in the clock opening in the glove locker door a glass-covered dial featuring the Pontiac name. Glove-compartment doors come equipped with lock and key on the deluxe six and eight. A light switch is now included on the lower edge of the instrument panel which may be adjusted for instrument panel lights only, or instrument and map lights, or both may be turned off. A red light also replaces the ammeter, giving warning at

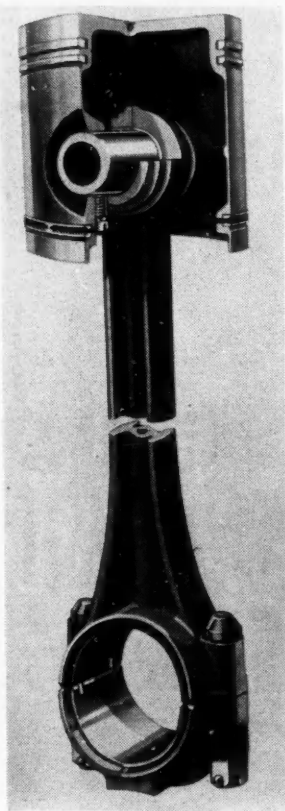
all speeds over 10 miles per hour when the generator is not charging.

A full three-passenger four-door sedan front seat cushion is standard on the deluxe six two-door sedan and touring sedan, as well as on the eight, giving these cars ample room for six passengers. The back of the seat is divided in the center and hinged to tilt forward for convenient entrance or exit of rear-seat passengers. For the same reason, the right front individual seat on the two-door six sedan models is now hinged.

Top hood panels sweep in an unbroken line forward to the radiator side grille mountings, and side panels have chrome plated grille-type louvers com-



1936 Pontiac has a new rubber cored spring shackle



New thin walled cast iron piston . . . lighter in weight . . . shorter skirt . . . three rings instead of four . . . heavier and stronger rifle-drilled connecting rod for the new Pontiacs

ing forward to a knife edge. Chrome trimmed brackets support the headlamps on the radiator shell. Further improvement in exterior appearance includes changes in fender design with more deeply crowned one-piece front fenders sweeping down to the bumper level. The conventional alley between the fenders has been largely eliminated. Rear fenders are more deeply crowned, with the rear half raked further back to a point below the wheel center. Rear lamps are mounted on the fenders.

Headlamps are adjustable to three positions: city driving, country driving and country passing. When the light switch is pulled full out, a small one-candlepower red light, mounted on the

speedometer dial, tells whether the country-passing beam is used.

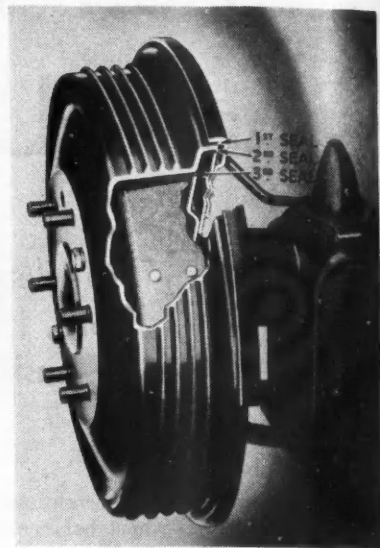
Front wheels on the eight and deluxe six now have zero toe-in and camber, which is expected to increase the tire life. Coupled with this camber change is a new front-wheel support arm 50 per cent more rigid.

On the six, the strength of the front spring eyes has been increased by extending the second leaf and wrapping it around the eyes at the front and rear ends of the spring. Tests of these new springs disclose that they last twice as long as conventional ones. On the eight the radiator cap has been replaced by a spring-loaded valve which opens only when a pressure of 5 lb. per sq. in. has developed in the cooling system. This permits the engine to run at higher temperature, and provides an extra margin of cooling capacity in extremely hot weather and under severe operating conditions. It also makes the cross-flow radiator even more economical of water or anti-freeze solution.

Another feature of the eight, as well as of the deluxe six, is the corrective balancing of front wheels wherever necessary by means of special balancing lugs fitted to the rims of front wheels opposite the heavy point, within a limit of ten ounce-inches.

Pistons of alloy iron with very thin walls are used in the 1936 Pontiac engines. The skirt thickness of the finished piston ranges between 0.040 and 0.050 in. and the weight of the

Triple sealed hydraulic brakes . . . new cast iron, ribbed brake drums and moulded brake lining are a new feature



3 5/16-in. piston for the six-cylinder engine is 1.52 lb.

No important change in foundry set-up was required to produce these new, thinner-walled pistons, but more care is necessary in preparing the molds.

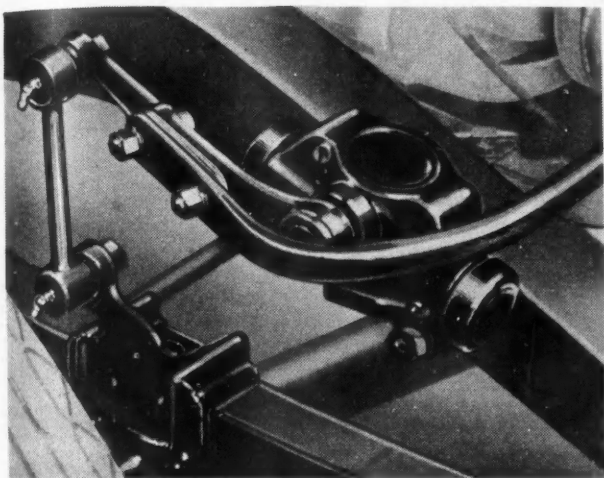
In producing this thinner-walled piston, it was found necessary to machine all core boxes to very close limits and take extra precautions to thoroughly clean the core boxes before starting to make each set of cores. This special care is necessary to eliminate the possibility of joint faces of the core boxes being held apart by one or more grains of sand, since a grain of sand is around .007 in. in diameter and would make the core larger by that amount. The analysis of the piston is as follows:

Total Carbon	3.30 to 3.55
Comb. Carbon	.50 to .60
Manganese	.50 to .70
Sulphur	.12 Max.
Phosphorus	.20 Max.
Silicon	2.25 to 2.50
Nickel	.15 to .20
Chromium	.15 to .25

These pistons are tin-plated on the outside, in accordance with the practice followed by Pontiac since 1930. The oil ring is located near the bottom of the skirt, and when the engine is stopped, it traps a film of oil between the piston and cylinder wall, which is available for instant lubrication when the engine is started again. This is of particular value in cold weather. It is pointed out that an oil ring at the bottom is more effective than one above the piston pin.

New Hood and Fender Treatment Marks the 1936 Dodge Line

(Continued from page 515)



The Dodge Ride Levelator consists of a drop-forged, heat-treated steel bar, the curved ends of which are bolted to the horizontal arms of the right and left shock absorbers. The Ride Levelator bar is located out of sight, behind the radiator grille.

when the headlights are switched off.

In two-door sedan and coupe models, body ventilation is provided through a

front-window control mechanism, giving the glass panel two movements; the first of these causes the panel to slide

backward so as to create a ventilating opening around which the onward motion of the car creates a suction, drawing air from the car interior. Continued turning of the window control then lowers the glass panel into the window frame.

The four-door models, in addition to the variable front-door-window ventilation, have pivoted rear-quarter windows capable of being set at different angles for whatever degree of ventilation may be desired. Additional ventilation is provided by a cowl ventilator and by the windshield.

Interior equipment includes an adjustable visor, rear-view mirror, instrument-panel parcel compartment, built-in foot-rests in four-door sedan models, etc. Smoking sets are built into the arm rests. Two ash receivers are incorporated in the instrument panel layout, one of them removable, for the insertion of radio controls. All closed bodies are wired for radio.

Knudsen Warns Against Restrictive Laws

(Continued from page 500)

industry. So that in design and manufacture, I submit the conclusion that the manufacturer has already done much for greater safety."

Mr. Knudsen then went on to say that "even the best mechanical device needs to be serviced, repaired, maintained." He described how General Motors conducts schools each year to educate mechanics in the proper methods of maintaining cars in proper and safe condition.

Taking up the question of speed, the speaker said "accidents seem to be more a product of congestion, visibility and other road conditions than speed per se." Mr. Knudsen urged that "we should go slow" in recommending restrictive legislation which might impair the usefulness of our friend, the automobile, and still not correct the accident situation."

Relative to the driver situation the GM executive pointed out there always will be persons operating cars who are unfit for the job, such as those who are unskilled in automobile operation, those who persist in driving when intoxicated, who ignore traffic signals, laws and rules of the highway and who will not keep their cars in proper repair. Asking what could be done to help this phase of the situation, Mr. Knudsen answered his own question with recommendations for better education of the driver and pointed to the youth of the nation as

the most fertile field in which to cultivate good drivers. Compulsory inspection of vehicles in all states at stated periods was recommended as another means of promoting safety.

Taking up the question of roads Mr. Knudsen pleaded for continuation of the effort to stop diversion of automobile taxes from highway construction and maintenance work by states.

"Let those, who, by diversion of these funds, have contributed to the retention of our inadequate highways consider their obligations to this great problem of safety," he said.

Earlier in his address Mr. Knudsen discussed in some detail one of his principal concerns, the foreman. He showed the foreman's position in relation to plant safety and emphasized the necessity for having the interest and cooperation of the foreman in all safety programs.

"Safety education of the workmen, or accident prevention work through the medium of education, has made its best progress through so-called campaigns for accident prevention, which most progressive factories inaugurate from time to time," Mr. Knudsen said. "It has been found that the prime formula for success in this kind of work is to get the foreman really enthusiastic about the standing of his department over a period; with the result that measures taken to accomplish the result become a permanent feature, and in this way improve the situation, not only during the period of the

campaign, but for all time.

"We have found in the Corporation that the foreman's interest in the safety problem is the all-important factor in getting rid of accidents of all kinds, severe or trivial. When the foreman has become thoroughly interested the men automatically become interested. The older and more experienced begin to look after the younger men with less experience. Careful reminders, in the form of pamphlets, without scare-heads, but with sound advice to be careful in the handling of machines and tools, gradually have the effect of overcoming the careless attitude which inexperienced men often assume toward the job in order to mask their inexperience. . . . If the safety record of a department becomes a matter of pride to the foreman, and to his men; if it becomes clear to all that lost time accidents represent pain and suffering, and that no accidents mean more health and happiness in the shop, and in the home, then safety has come into its own."

Mr. Knudsen told his audience that in the matter of safety in the product manufactured the maker can control the circumstance under which it is made, but he has no control over who is to be permitted to use it; the circumstances under which it is to be used or the behavior of the individuals using the product.

"There is no industry where this is more evident than in the automobile industry. We have a fairly good record for safety in our manufacturing operations, but we have no control over the conditions under which our product is used."

Paris Show Reveals Trend

by W. F. Bradley

Paris Correspondent of Automotive Industries

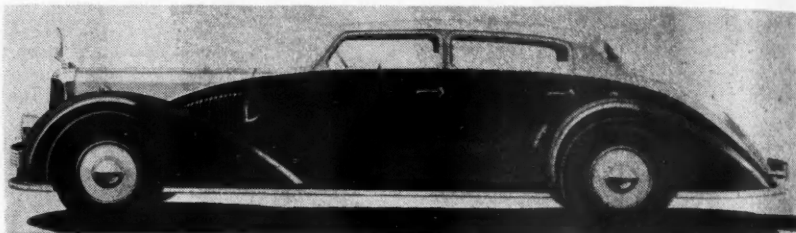
WITH 32 French manufacturers (ten of these making trucks only), nine English firms, 10 Germans and four Italians, the Paris Automobile Salon can claim to be fully representative of the European automobile industry. The United States has eleven makers in the Champs Elysees hall, these being Auburn, Chrysler, Dodge, De Soto, Fargo, Ford, Hupmobile, Graham, Packard, Pierce Arrow, and Studebaker. There are no cars from the General Motors group, but this is due to a policy which has been followed for several years.

Considered technically, this year's show reveals no great change of policy, or any startling innovations. Independent suspension, streamlining, and automatic or semi-automatic gear shifts, were all features to be seen a year ago, and they have all developed another stage.

While engineers are working on streamline forms which involve a redesigning of all the chassis components, these have not yet made a public appearance. All the energy has been spent on reducing head resistance with the present mechanical layout, and the most general tendency is to increase the width of the body to the extreme width of the chassis, thus abolishing the running boards, and at the same time to decrease the total height.

This tendency has extended to the big makers and in France is followed by Peugeot and Renault. With a full width front seat, carrying three abreast, there is greater necessity for abolishing the central levers. Renault curves the change speed lever, carrying it forward from the point where it emerges from the box, then bringing it through the instrument board. Peugeot mounts the lever through the instrument board and connects to the gear-shift by means of cables on the forward side of the dash. On several cars the hand brake is now mounted on the dash.

Voisin, who is working on a radial rear engine to get the maximum advantages from streamlining, is satisfied this year with a full width body, the sides of which tumble home into the roof, thus reducing the area of the cross section. A somewhat similar ar-



Voisin full-width streamlined model with sides rounding into the roof

rangement is adopted by Maybach with a very original streamlined job.

Front-end treatment is causing considerable difficulty, and one of the practical disadvantages of the new lines without running boards is that the side panels cannot be kept clean, even when running on well-paved roads. Peugeot has placed the headlights behind the radiator cowl, while the practice of recessing the lamps in the front fender is more general. Rear ends are giving less trouble than the front, the general arrangement being baggage compartment behind the rear seats and inclosed spare wheel. In not a few cases the gasoline tank has been redesigned to form a platform flush with the side rails, the baggage compartment being built above this. One maker reserves a battery compartment by the side of the gas tank, access to this being attained by lifting the hinged tail and taking out a trap in the flooring. Rear wheels are inclosed on numbers of normal cheap production jobs. Difficulty has been experienced in keeping these wheel housings mud tight. Unless the fender is a part of the body pressing, muddy water is forced through the joint.

Box-section frames are more general than ever, combined with either tubular cross members or with box-section X-members. This rigid construction has been developed partially to assure better steering and partially because of the new body styles.

Independent wheel suspension can hardly be considered a novelty, from the European standpoint. German makers are 100 per cent for it. In France the only important makers who

claim to get equal results with rigid axles are Renault and Hotchkiss. In Italy, Fiat stands out against independent suspension, but Alfa Romeo has found it advantageous for racing cars. England has shown herself somewhat indifferent to this move, but there is now a notable recruit in Rolls Royce, with a new 12-cylinder job, shown here for the first time, with independent front wheel suspension, by means of inclosed coil springs and wishbone attachment.

The transverse spring and wishbone attachment is the type of independent suspension now most generally adopted, with the wishbone and coil springs, according to Mercedes patents, a close second. Maybach has an interesting model with a transverse spring front and rear, the anchorage of the spring being very high, and vertical coil springs being also used, with wishbone attachment. The rear end of this chassis has a big diameter tubular cross member welded to the side rails and carrying the differential housing. The universal joint drive shafts are inside this housing and are protected by flexible mud-excluding gaiters.

Unic has brought out a new chassis with front independent suspension by means of semi-elliptic springs and a couple of three-quarter length I-beam axles, each axle being clipped to the spring and having its opposite end shackled to the outside of the frame member. This was on view a year ago as a demonstration model, but is now in production.

England led the way in the matter of easy gear shifts, but this movement has now spread to France. Talbot and

Toward Full Width Bodies Without Running Boards

Delahaye make use of the Wilson planetary transmission. Unic, Chenard & Walcker, Voisin, Salmson and Peugeot fit the Cotal planetary transmission with electro-magnetic control. Peugeot is displaying this transmission in conjunction with the Fleischel control, the gear shift being entirely automatic and operated by a combination of centrifugal force and intake manifold depression. This fitment is not standard and is only offered on an extra payment of \$400, which is a high extra for a car selling in the neighborhood of \$1,500. Fleischel claims that Fiat is also interested in this transmission, but nothing has yet been brought out by that firm. The German tendency is toward synchro-mesh gears.

Aluminum-alloy cylinder heads are being more extensively employed, and compression ratios are going up in consequence. Renault has made this move for practically all his models this year. With taxation being levied on gas consumption only, French makers have directed their efforts toward fuel economy, with the result that there is a revival of the four-cylinder engine and new developments in carburetors. A direct-injection device has been put on the market by the O. S. Company.

Front wheel drive does not show any extension. It is found on some of the German light cars, and in France it is employed by Chenard & Walcker, Rosengart, Derby and Georges Irat. These two latter have very limited production.

Citroen, now controlled by Michelin, with M. Pierre Michelin as president of the board, has gone back to rear-wheel drive on two models. Broadly, the firm has two types of engines and four types of chassis, two being with front drive and two with rear drive. As Citroen's battle cry only a year ago was front drive, this change of front is an admission that rear drive has still a lot in its favor. Rear-engine jobs are rare, the only notable example being the Mercedes.

Hydraulic brakes are on the increase, to the detriment of the mechanically operated type. Westinghouse has produced a new type of air brake which

admits a variable quantity of pure air into the cylinders and closes a valve on the exhaust pipe. A single lever is used for the operation, the first portion of the movement being the admission of air to the engine and the second portion of the movement closing the valve on the exhaust pipe. The compressed air can be carried to a reserve tank for tire inflation or for emergency braking.

Notable among the American exhibits was the new V-8 Ford, model 62, with a piston displacement of 134 cu. in. This is being built in the Mathis factory at Strasbourg and will be marketed under the name "Alsace" at 24,500 francs (\$1,633). The all-metal bodies are being built by the Chausson Company, in Paris, under Budd license. It is expected that deliveries will begin toward the end of the year.

The commercial-vehicle section of the show indicated that renewed attention is being paid to the Diesel. Several of the important French firms have taken out licenses for the English Gardner, among these being Latil and Chenard & Walcker. The latter has an 18-ton truck and semi-trailer, with a Cotal six-speed planetary transmission, with electro-magnetic control and an electric brake on the transmission, in addition to mechanically operated brakes on the road wheels.

The O. S. vaporizer, just put on the market by the Seignol Company, avoids the use of a mechanical pump, the suction in the carburetor itself being made use of to bring the fuel from the tank. For ease of manufacture and simplicity of mounting, the instrument is in two parts—a float chamber containing a jet and a venturi tube, which is connected up to the gasoline tank and may be mounted in any position to about 25 in. from the engine. This instrument, which supplies a rich and incombustible mixture, is connected to the second chamber, mounted on the intake manifold, by means of two tubes, one connecting to the lower and the other to the upper part of the venturi. The vacuum in the two zones at the top and bottom of the venturi varies in direct relation to the opening of the additional air valve, the maximum being reached when the valve is wide open. The vaporizer makes use of the differential effect of these two vacuum zones to regulate the output of carburetted gas and the admission of additional air. In addition to avoiding the use of a mechanical or electric pump, it is claimed that this vaporizer reduces fire risk, does not show any loss at altitude, that it gives a more uniform mixture, and that it can be arranged for up-draft, cross-draft, or down-draft.



Maybach ultra streamlined job

Design Trends

By A. F. DENHAM

THERE are under development today in the United States, for eventual introduction to the public, more than half a dozen different types of rear-engined and front-drive cars. That one or two of both types will be announced before the end of the year is virtually certain. Others may not appear for a year or two, depending on sales developments and satisfactory solution of engineering and production problems.

Of these, the engineering problems are still the most important. True, experimental development has been under way for some time now, but as designers progressed—both on the drafting board and in experimental work—new problems arose continually. Some theories, once widely accepted, have already been exploded, and new ones, based on practical experience, have taken their places, while other expectations have been confirmed in a major or minor degree.

Of the fundamental problems to be solved in the development of such cars, the first, of course, is that of the type and design of a unit powerplant and drive mechanism—whether the car is to have a front drive with forward-mounted powerplant, or a rear drive with a rear-mounted powerplant.

Until fairly recently, designers have predicated such unit assemblies largely upon the use of conventional engines, transmissions, etc. Obviously, if such development were feasible, it would considerably expedite the introduction of such cars, since development time could be curtailed and tooling costs kept down. Abroad this has not been entirely the case, and powerplant drive arrangements have actually been developed with the front drive or rear-engined installation in mind. Such cars, however, hardly come under the designation of "production automobiles" as we know them.

As Mr. Heldt has already pointed out, the tendency to use what was already available in production, has involved the attempt to use rather long engines—since the trend in engine de-

sign in this country has been toward multiple cylinder-in-line types.

If such engines had worked out satisfactorily, the story would have been a different one. As a matter of fact, many of the criticisms which have been directed at recent attempts in this country to produce and market front-drive and rear-engined cars were based on the fact that it was attempted to use available units rather than to develop new ones.

Another factor that has retarded the development of successful production models of either the front-drive or rear-engined type, has been the claim made

black eye. Many a motorcar-company executive was so well satisfied of the lack of promise of such vehicles that he considered it entirely unnecessary to spend large sums in engineering development, new tooling, and equipment, etc., to "meet the new competition."

It is realized that if the industry be taken as a whole, there is no crying necessity today for the development of such cars. The market for automobiles is primarily a replacement market. It can be expanded only through the development of cheaper automobiles. Since the cost of developing sound rear-engined cars, or front-driven ones for that matter, justifies little immediate hope in that direction, even if weight could be materially reduced, the preference of the industry—as an industry—is to stick pretty close to what it

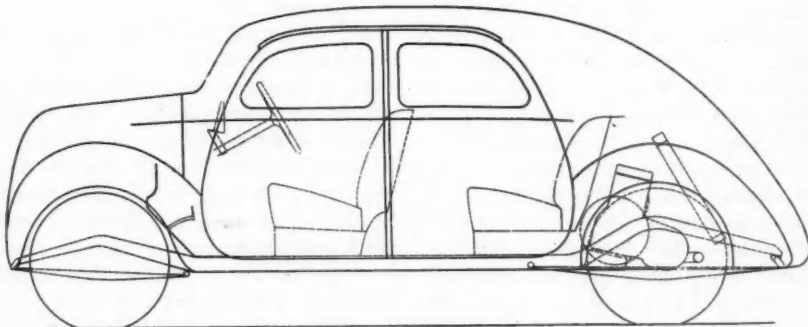


Fig. 1—Rear-engined car with transverse six-cylinder engine ahead of the axle

in some quarters that such cars offer a panacea for virtually all of our motorcar ills. Everything from light weight through improved riding qualities, greater ease of handling and greatly increased body room for a given length, to elimination of engine noise and of the heat insulation problem, has been included in these claims.

When half-hearted attempts by one or two factories to develop such cars did not bear out the claims made by their proponents, the whole idea of front-drive and rear-engined cars received a

already has and can build profitably in the quantities required.

With an increasing market for automobiles, however, inter-company competition has again become keener. It is the all-important factor underlying the experimental work now going on. The development, moreover, is not confined to the independents. Each of "the big three" has a development project of this kind under way either openly or under-concealed identity.

Obviously, it would serve no useful purpose at this time, nor would it be

Stimulate Interest in Powerplant-Drive Units

Part V

In four previous articles by P. M. Heldt (AUTO-MOTIVE INDUSTRIES, August 24, August 31, October 5 and October 12) recent developments in unit-powerplant-drive arrangements for front drive and rear engined cars have been reviewed. This article by Mr. Denham attacks the subject from an analytical standpoint, investigating the comparative effects of different powerplant-drive arrangements on various features of design and on operating characteristics.

ethical, to reveal details of any of these projected cars. It can safely be said, however, that of the more promising designs, not a single one incorporates a conventional automobile powerplant as we know it today—if we may regard the short Vee engine as unconventional.

This is due to the now well-established fact that, unless gains are achieved in powerplant compactness over present-day practice, body room fore-and-aft, in either front-drive or rear-engined cars, will be no greater than with conventional automobiles for a given wheelbase or overall length—and, other factors being equal, overall length and weight control automobile costs.

From this standpoint alone the conventional in-line engine automatically eliminates itself from the picture, unless it be transversely mounted in the chassis, an arrangement quite feasible with rear-engined cars, but not readily adaptable to front drives if more than four cylinders be used. Even in rear-engined cars, however, practical considerations eliminate large eight-in-line engines.

The Vee-type engine is more practical from this standpoint and possesses the added advantage of lower potential weight per horsepower. However, today only one manufacturer is producing a relatively short Vee-type engine, and it is questionable whether development of such an engine by other manufacturers—rather than of even more compact and lighter designs—would be justifiable.

However, new engines are required not only for reasons of compactness. The question of weight also is vitally important, particularly in connection with rear-engined cars. The argument that concentration of all power and driving units at one end of the vehicle makes lighter body and frame structures possible is sound enough, as far as it goes. But lightening the car as a whole increases the proportion of powerplant weight to total sprung weight.

This proportion is further increased by including the differential in the concentrated sprung mass of the power-plant drive unit. Thus, as weight is taken out of the car at other points the weight distribution becomes disturbed still further. At least the experimental results so far have not been "completely satisfactory" under such conditions.

From a weight standpoint, two-cycle engines offer distinct possibilities, of course, but it is doubtful whether the industry is ready for this development as yet. Fundamental problems involved in combustion and "pumping" control have not as yet been satisfactorily solved. Barrel-type engines are still farther off, perhaps. It is obviously impossible to illustrate and discuss in the space available all possible engine and powerplant types. Omitted from the illustrations and discussion to follow are such important types as the X-engine and fan types. The latter, however, may be regarded as semi-radials, and the analysis can be readily applied to them.

For the purpose of this study, eight powerplant-drive variations have been laid out. The engines all have approximately the same displacement, about 200 cu. in. Transmission and differential dimensions are based on available

designs adopted to such installations. They are predicated on equal torque capacities in all installations. The in-line engines (transverse) use conventional transmission types. The Vee engines are worked out with a split type of transmission—for compactness where the engine is in line with the transmission—while a conventional gear-box size is again used where the Vee engine is located above the differential.

For use with the radial engines, a specially short transmission was evolved, which worked out better than the conventional type.

In laying out these cars, the starting point was a given and fixed set of interior dimensions, affording leg and head room comparable to that of low and medium-low priced cars of today. Front and rear seats were laid out to accommodate three passengers comfortably, except as regards the rear seat of the front-drive cars. In the rear-engined vehicles, the wheel-housings are located back of the seat, permitting the use of full-width seats. With the front drives, however, the wheel housing was moved forward somewhat, to avoid an undue increase in wheelbase and overall length. With this one exception the wheelbases and

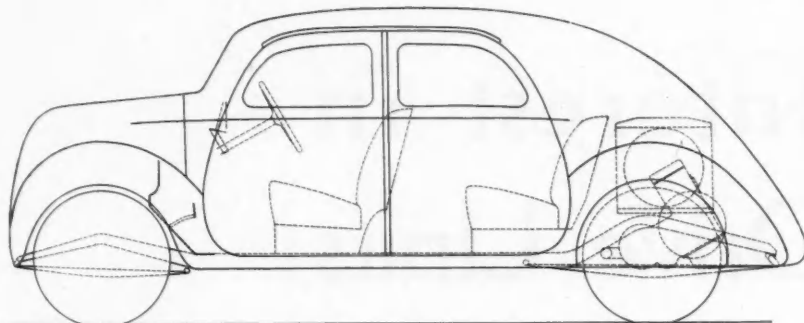


Fig. 2—Rear-engined car with transverse six-cylinder engine back of the "axle." (Installations shown by Figs. 1 and 2 are not well adapted to front drives, due to width limitations ahead of the dash)

the overall lengths of the different vehicles are controlled entirely by the characteristics of the specific installation.

While running boards were eliminated and side panels extended correspondingly, no attempt was made to develop special body structures—or body-frame units—although such a development is highly desirable for both rear-engined and front-drive vehicles.

To make comparisons easier, the majority of the cars are laid out as rear-engined vehicles. Such factors as wheelbase, overall length, weight distribution, etc., vary in the front drives in the same manner as they do in the rear-engined cars with similar installations. As a starting point for the front drives two models are shown, one with a radial engine, giving about the most compact arrangement possible, and one with a Vee-type eight, with a split transmission, and with the engine back of the "axle."

Wheelbase Length—In comparing the designs shown in Figures 1 to 8 herewith, various points of difference will be noted. Fundamentally, both rear-engined and front-drive cars call for longer wheelbases than conventional automobiles of the same over-all length, but the increase in wheelbase length varies with the particular design. If semi-elliptic rear springs are to be used, the shorter-wheelbase rear-engined cars will give better rear-spring layouts.

Of the designs illustrated, those of Figs. 1, 2, 3, 5 and 6 have virtually identical wheelbases. Placing the Vee-eight engine ahead of the differential, as in Fig. 4, calls for a 10 per cent increase in wheelbase. Removal of the radial engine to the front, for a front-drive car, demands a 5 per cent increase in wheelbase, even though the

wheelhouses and rear doors may be modified to shorten the tail to some extent.

It will be noted that in some of the illustrations, the differential center and the wheel centers are not in the same vertical plane. This involves a slight angling in the plan view of the propeller shafts between differential and wheels, to achieve the most compact installation consistent with optimum wheelhouse location.

It will be noted that the use of a Vee engine increases the wheelbase 10 per cent, in spite of a slight angling of the shafts and the fact that the differential is located between engine and transmission and the clutch on the far side of the transmission.

If a Vee engine is to be used, the design of Fig. 5 works out as short as that with a transverse or radial engine. In this design the engine is located fairly high, with chain or gear drive to the transmission mainshaft below, and then forward to the differential.

In Fig. 6, with a radial engine at the rear, the wheelbase could be shortened slightly by modifying the wheelhousing in the same manner as in Fig. 7, since there is adequate powerplant clearance back of the rear seat. Actually the front-drive-car with radial engine, Fig. 7, has a wheelbase some 5 per cent longer than that of the car shown in Fig. 6, and a modification of the wheelhouse for the same rear seat width in the latter would further increase the difference.

The wheelbase of the car shown in Fig. 8 (Vee-engine, front drive) is some 15 per cent longer than that of Figs. 1, 2, 3, 5 and 6, and approximately 5 per cent longer than that of the equivalent rear-engined layout, Fig. 4. As a matter of fact, front drives as laid out above call for approximately 5 per cent more wheelbase than the equivalent rear-engined cars for the same body room and powerplant-drive layout.

Further, it should be noted that while the cars shown in Figs. 4, 7 and 8 have longer wheelbases, those of Figs. 1, 2, 3, 5 and 6 have wheelbases about equivalent to conventional cars of the same body dimensions. On the other hand, the overall length of some of these cars is considerably less than that of conventional cars with the same body room.

Over-all Length—This applies to the cars shown in Figs. 1, 2, 5, 6 and 7, all of which are about three per cent shorter than conventional cars of the same body room and (as we have seen) wheelbase. The layout in Fig. 3 gives about the same overall length as a conventional design. On the other hand, moving the Vee engine ahead of the axle increases the overall length some 10 per cent as compared with the transverse or radial rear-engined types, the only Vee-eight installation comparable

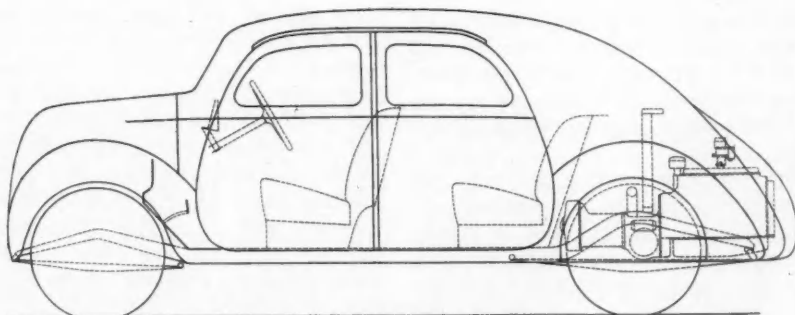


Fig. 3—Rear-engined car with a Vee-eight engine back of the differential, with clutch and transmission ahead of the differential

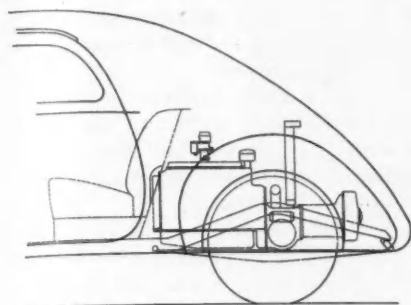


Fig. 4—Rear-engined car with a Vee-eight engine ahead of the differential (the reverse of Fig. 3)

to Figs. 1, 2, 5, 6 and 7 being that shown in Fig. 5, with the engine above the transmission and differential.

Comparing front drives with rear-engine installations, a five per cent increase in length of the former over the latter will be noted, for the same basic powerplant-drive layouts. The front-drive cars might possibly be reduced to the same length, but it should be noted that they have been shortened already by moving the rear wheelhouses up to the rear seats, which necessitates reducing the width of the seat somewhat.

From the standpoint of over-all length it should be noted also that the radial engines are laid out with an unusually compact transmission of unconventional design. The split transmission is not well adapted to this case, since the differential must be located far enough back of the engine to permit locating the engine high enough in the chassis for proper road clearance. Otherwise either the propeller shafts have to be angled down too much or else a double reduction drive from the transmission must be used.

The advantage of a radial engine, particularly for front drives, from an overall-length standpoint, is made evident by a comparison of Fig. 7 with Fig. 8, in which latter a Vee eight is used. The latter is some 15 per cent longer than the former.

The car of Fig. 2 could be shortened somewhat by pulling in the tail, but this would be accompanied by rather evident sacrifices in appearance and rear seat head-room.

Weight Distribution—No attempt has been made here to evaluate the possible weight reductions with different types of powerplants and different arrangements, since too many variables are involved.

As to weight distribution itself, too

little is known today regarding the qualitative effects of variations in weight distribution for either front-drive or rear-engined cars. As Mr. Heldt has pointed out in preceding articles, the front-drive car does require a higher percentage of weight on the front wheels for adequate traction. From this standpoint, reduction in body weight might help the front drive—lighter powerplants would not. In rear-engined cars, however, lightening of powerplants is essential to a reduction in total weight.

It is not the writer's purpose to discuss theories regarding effects of weight distribution, but merely to show how the various installations affect weight distribution—quantitatively rather than qualitatively. To this end, powerplant and body weights have been assumed to be equivalent to good current design practice.

With the transverse engine ahead of the axle (Fig. 1) the load on the front axle is approximately 5 per cent greater than with the engine back of the differential (Fig. 2).

Using Fig. 1 as the basis of comparison, the Vee engine in back of the axle (Fig. 3) decreases the weight on the front wheels some 10 per cent. Placing the Vee engine ahead of the axle (Fig. 4) makes the weight distribution about the same as in Fig. 1, for while the center of gravity of the engine is farther ahead of the differential, the increase in wheelbase, referred to above, substantially offsets this change.

The design in Fig. 5 falls about midway between Figs. 1 and 2 as regards weight distribution. On the other hand, the radial-rear-engined model (Fig. 6) has 7 or 8 per cent less weight on the front wheels than Fig. 1.

Differences between the various types of powerplant-drive installations are

not as great in front-drive as in rear-engined cars, due to the naturally more nearly equal weight distribution. Of course, the radial engine of Fig. 7 gives less weight on the rear wheels and more on the front than the Vee-type engine of Fig. 8. A still further increase in weight on the front wheels could be obtained by placing the engine ahead of the front "axle," if such a design were not objectionable from an appearance standpoint. The transverse engine is not applicable to front drives as here laid out.

Center of Gravity—The location of the center of gravity lengthwise of the car varies directly with the changes in weight distribution mentioned above. The heights of the centers of gravity of Figs. 1, 2, 3 and 4 are practically identical. That of Fig. 5 is obviously greater—giving an increased rolling moment on turns, if conventional suspensions are used. The radial-engined cars also have slightly higher centers of gravity, but the change is relatively slight.

Generally speaking, the centers of gravity of bodies of rear-engined and front-drive cars will be lower than those of conventional cars, advantage being taken of the absence of the propeller shaft, etc., to lower the bodies, etc.

Roadability—Roadability is another item that is rather indeterminate, depending as it does on so many other factors besides powerplant-drive design and location. Figs. 3 and 5 probably would require more development work to obtain the same roadability results than the other types illustrated.

Steering—Steering ease is improved as the center of gravity is moved away from the front wheels, since the loads on the wheels and the gear are simi-

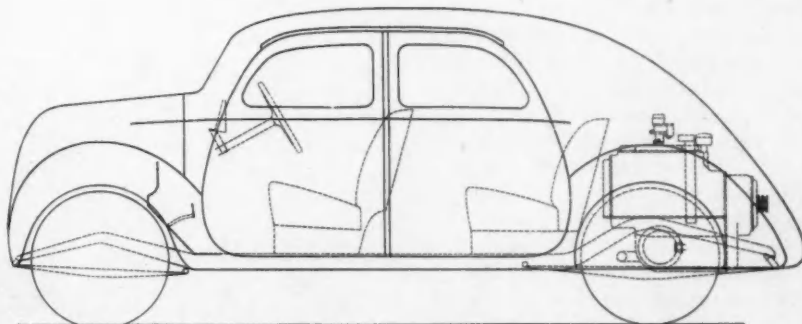


Fig. 5—Rear-engined car with a Vee-eight engine over the transmission and differential. (This installation also is not well adapted to front drives, because the hood required would be too high for good visibility)

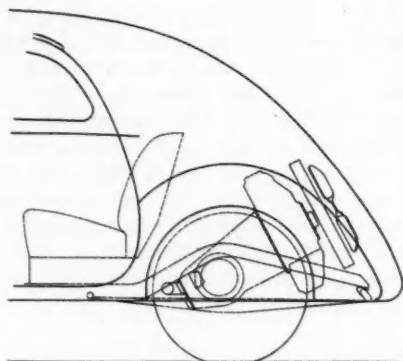


Fig. 6—Rear-engined car with radial seven-cylinder engine located back of the differential

larly decreased. This is a point that has frequently been made for rear-engined cars. While this is true as far as it goes, experience seems to indicate that if the load on front wheels is reduced too much the steering stability is unfavorably affected. Moreover, location of the center of gravity of the powerplant assembly back of the axle, as in Fig. 3, has a definitely adverse effect on steering "feel," probably because the establishment of a false moment about the rear wheels counteracts the centrifugal load on the front wheels.

In a front drive having the center of gravity of the powerplant ahead of the axle, such a false moment might tend to decrease rear-wheel skid on turns. It is not likely, however, that anyone will produce a front-drive car with the engine actually completely ahead of the axle, unless it be a radial or its equivalent. With front-drive cars, of course, powerplant lightness is desirable for steering ease, which conflicts with requirements for adequate traction, as mentioned under weight distribution. With rear-engined cars there is danger of getting too little load on the front wheels, and again, therefore, powerplant lightness is essential. From a steering standpoint, the designs of Figs. 1 and 4 would work out materially better than those of Figs. 3 and 6, while Figs. 2 and 5 range somewhere in between.

Riding Qualities—Here again we have a problem for which there is no simple theoretical solution or qualitative analysis. Types of springing, location of suspension, spring rates, location of centers of percussion, etc., all affect this question, in addition to the matter of weight distribution. It should be noted, however, that there is an automatic decrease in both total unsprung weight and in percentage of unsprung

weight for both the rear-engined and front-drive cars as compared with conventional vehicles—traceable mainly to the springing of the differential assembly, etc., in unit with the powerplant. All of the rear-engined cars so far produced in this country, experimentally, give a remarkable rear-seat ride.

Braking—Distribution of braking effort between front and rear wheels varies with the weight distribution of the cars as shown. On the whole, the rear-engined cars seems to give somewhat better brake distribution than front-drive cars with the same powerplants. The effect of weight transfer is, of course, more pronounced when braking than when accelerating, since the rates of deceleration are higher than those of acceleration. Lighter powerplants would probably help the rear-engined cars from a braking standpoint.

From a weight transfer standpoint it may be noted that the design of Fig. 5, with its higher center of gravity, transfers more weight to the front wheels under brake application than other designs—probably a desirable factor.

Costs—There is comparatively little difference in the overall costs, aside from the powerplants, of the various designs shown, assuming completion of development work, tooling and production equipment. The greater overall length of the car of Fig. 4 might indicate a somewhat higher weight and costs, but this is offset to some extent by savings made possible by the short wheelbase. The design of Fig. 1 appears to promise a lower cost for body and frame structure than the others illustrated.

The front drives shown would be somewhat more costly (body and frame construction), particularly that of Fig.

8, which has the greatest overall length for a given body size. On the other hand, the front-drive cars probably make possible a somewhat cheaper cooling system layout.

There is little to choose between the various designs as far as ease of assembly is concerned, but there are considerable differences as regards accessibility for servicing.

Accessibility—From a service standpoint it appears highly desirable that all installations should be worked out to permit unit removal of the entire powerplant and differential assembly, whether a front-drive or a rear-engined car is produced. The layouts of Figs. 2 and 3 probably provide best accessibility to the engine on the cars, while Figs. 1 and 4 permit ready access to the transmission. The advantage of the split-type transmission is indicated by the fact that Fig. 3 is the only one of this group that does not give ready accessibility to the clutch. The unit would probably have to be serviced by removing the rear seat and lower rear body panel. The same would probably apply to servicing the timing drive in Fig. 4. The design of Fig. 5 provides accessibility to the engine and clutch, although the transmission is not as readily serviced.

In Fig. 6 the clutch and transmission are not readily accessible. The radial engine works out better from this standpoint in the front-drive installation (Fig. 7).

Visibility—All of the installations here shown permit greater forward visibility than do conventional cars, with the possible exception of the powerplant of Fig. 5 when used for a front-drive, which calls for a high hood, and that of Fig. 8, requiring a long hood. The rear-engined cars, of course, have the advantage over front drives in respect

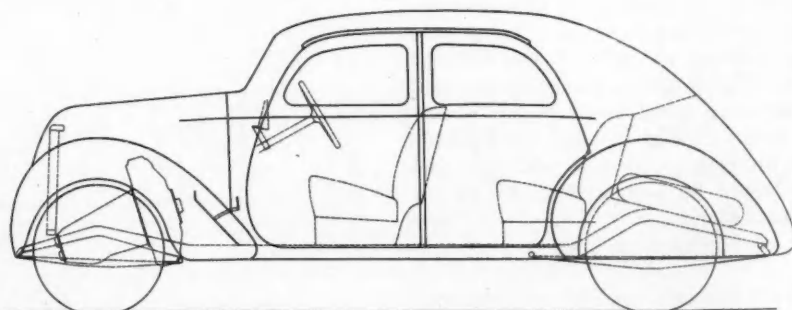


Fig. 7—Front-drive car with radial seven-cylinder engine located back of the differential (which corresponds to the arrangement of Fig. 6 for rear-engined cars)

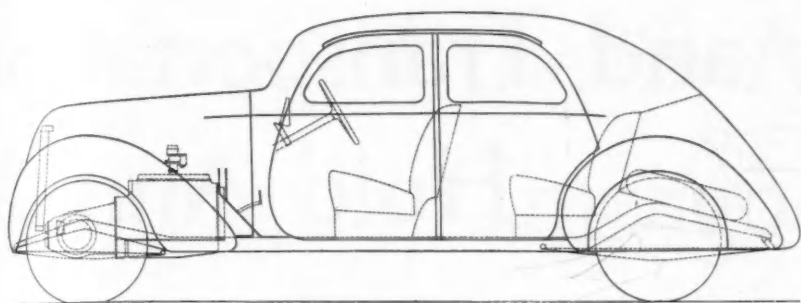


Fig. 8—Front-drive with Vee-eight located back of the axle (which corresponds to Fig. 4 for rear-engined cars)

to visibility in the forward direction.

There is not the same advantage with respect to rearward visibility, and care must be taken to avoid excessive blind spots in the rear quarters. The design of Fig. 4 calls for a rather deep rear window, due to the slope of the rear panel.

Noise—Much has been said in engineering discussions and in print on the subject of noise, particularly as related to rear-engined cars. The idea that locating the engine at the rear automatically eliminates all powerplant noises, though widely prevalent, is, of course, entirely erroneous.

Rear-engined installations have definite noise problems of their own. With careless design it is quite possible to have more noise reach the occupants than in conventional cars.

Rubber mountings, of course, must be used for the entire powerplant and drive assembly. Moreover, with the differential in unit with the powerplant, it is practically essential to provide resiliency somewhere along the line in the drive mechanism, to prevent torque impact. From this point of view, the layouts of Figs. 3 and 4 probably are somewhat better than the others, due to greater resiliency in the drive.

When it comes to noise questions, much depends also on the type of body and frame structure. Experience would seem to indicate, that tubular frames are decidedly bad, as the air column in the tube is an excellent transmitter of noises from the rear of the car.

In rear-engined cars, fan noise is probably even more difficult to overcome than in the conventional type. Further, fans of rear-mounted engines consume more power than those of conventional or of front-drive cars. Much, of course, depends on the proper control of air currents in the tail of the vehicle. Locating the fan as far back as possible—to get it further away from the pas-

sengers—may not do any good, for if the fan blast impinges on a body panel, noise will be conducted through the body in the form of beat notes. Noise insulation of bodies is absolutely necessary, and resonance should be carefully guarded against.

In front-drive cars the general conditions affecting noise are similar to those in the conventional car, though somewhat more aggravated.

Heat—To minimize the transmission of heat to the body, it is desirable to keep the radiator and exhaust manifold away from the rear seat panel. Figs. 1, 3 and 6 give the best layouts, while the design of Fig. 4 is good as regards heat from the radiator but bad as regards exhaust-manifold heat. It would seem that Fig. 5 does not lend itself to a good layout from either angle.

In the case of front-drive cars, the problem is quite similar to that with conventional cars, so that it requires no discussion here.

Engine Cooling—Engine cooling presents no new problems with front drives. All that is necessary is to assure adequate frontal radiator area, to avoid too thick a core.

With rear-engined vehicles, however, adequate cooling is not as easily obtained. Since there is no natural current of air through the radiator due to head-on wind pressure, provision must be made to assure a free entrance for cooling air, and it is even more important to have a satisfactory outlet for the air from the tail.

Streamlining studies will be important from this standpoint. Air from the cooling system must be ejected from the car at areas of negative pressure, to avoid back-pressure and resultant inadequate air-flow. Shrouding of fans seems called for. A blower type of fan might help, as it would permit of a reduction in the radiator size, but it would probably consume more power.

Air cooling of engines is another possibility that should not be overlooked in connection with either rear-engined or front-drive cars.

Controls—Controls are obviously more of a problem with rear-engined than with front-drive cars. Some of these problems are fairly easy of solution, of course, as, for instance, by the use of electric-drive speedometers and windshield wipers, and electric-type instruments for the dash.

Transmission and clutch control present some difficulties. The most obvious solution—cable controls—is unsatisfactory, due to the necessity of mounting powerplants in rubber. Tubular controls may work out better, and hydraulic clutch control seems feasible. However, for rear-engined installations, with transmission and clutches should probably be at least semi-automatic.

Heats of Vaporization of Gasoline

ONE of the hazards of aviation results from the fact that when an airplane flies through a fog or through air of high humidity, at temperatures near the freezing point of water, there is a tendency for ice to form around the engine throttle or in other parts of the intake system, as a result of cooling produced by evaporation of the fuel. This ice has a throttling effect on the engine, resulting in a loss of power. In extreme cases the throttling may be sufficient to stall the engine.

In the September number of the *Journal of Research* it is shown that the rate of formation of ice under given conditions will be proportional to

the product of heat of vaporization and the rate of vaporization of the fuel in the carburetor. The investigation reported in this paper was undertaken for the purpose of obtaining data on the heats of vaporization of a number of fuels. The values obtained for the heats of vaporization of the various fuels are so nearly the same that it is concluded that large differences in the rate of formation of ice with different fuels cannot be attributed to differences in heat of vaporization, but must be due to a large extent to differences in the completeness of vaporization in the carburetor, resulting from the different volatilities of the fuels.

Tractor and Transportation Hold Annual

EW. LAVERS, chief engineer of the Minneapolis-Moline Farm Implement Co., was nominated for the vice-presidency of the Tractor and Industrial Power Equipment Division of the S.A.E. at the annual meeting of the Division, which was held in conjunction with the annual transportation meeting of the S. A. E. at the Palmer House, Chicago. The transportation meeting took place on Thursday, Oct. 10, while the tractor and industrial power-equipment meeting took place on Friday and Saturday, Oct. 11 and 12.

There were two sessions at the transportation meeting, the morning session being devoted to the subject of tires and presided over by L. V. Newton, while the evening session was devoted to problems of truck loading (and overloading) and was presided over by F. L. Faulkner.

There were three sessions during the tractor and industrial power equipment meeting, the morning session on Friday being devoted to industrial research, the afternoon session to metallurgical topics and the Saturday morning session to transmission problems. At the research session, which was presided over by C. E. Frudden of the Allis-Chalmers Manufacturing Co., T. A. Boyd of General Motors Research Corporation gave a talk on "Research in the Automobile Industry." Greetings were extended to the members present by W. E. Stout, president of the S. A. E., W. C. MacFarlane, president of the Farm-Equipment Institute, and Ralph R. Teetor, chairman of the S. A. E. Research Division. At the business session of the Tractor and Industrial Power Equipment Division, C. G. Krieger, chairman of this Division, discussed activities in the field covered by it.

The metallurgical session was presided over by L. B. Sperry of the International Harvester Co. At this session H. W. McQuaid of Republic Steel Corporation presented a paper on "Metallurgical Aspects of Tractor Gears." The discussion was participated in by G. E. Robinson, International Harvester Co.; H. Bornstein, Deere & Co.; G. L. Willisma, Cleveland Tractor Co.; J. Fletcher Harper, Allis-Chalmers Manufacturing Co., and E. F. Davis, Warner Gear Co.

A. W. Frehse of Chevrolet Motor Co.

read a paper on "Some Thoughts on Present-Day Automobile Transmissions" at the Saturday session, presided over by Elmer McCormick of John Deere & Co. J. A. Bundy of the International Harvester Co., S. M. Ran-

some and J. P. Bruer of Barber-Colman, B. W. Keese of the Wisconsin Axle Co., and L. A. Bixby of the Clark Equipment Co. participated in the discussion. The attendance at the meeting was about 125.

Following are abstracts of some of the papers presented at the meetings.

The Design of Present Day Automobile Transmissions

SOME examples of how workmanship affects the strength and life of transmission gears were given by A. W. Frehse of the Chevrolet Motor Co. in his paper on "Thoughts on Present-Day Automobile Transmissions." In one case four experimental transmissions were built from the same blueprints, two by one company, the other two by another. The idea behind the design was to use fine and modified-pitch gears in order to get more teeth in contact, thereby reducing the load per tooth and the size of the gearbox. Each of the two companies built the transmissions according to the drawings, and the routine inspection disclosed no departures from the limits regarded as normal at the time. However, two of the transmissions failed after about two hours' break-down test on the dynamometer, while the two produced by the other company averaged 20 hours before failure. It was later found that minute hidden flaws in workmanship and material had caused the early failure of the short-lived gears. These flaws would not have been detected by any routine inspection in use at that time.

The other example concerned the use of herringbone gears of two different pitches to secure a quiet drive. The idea was fine, but when it came to producing them it was found that errors of tooth spacing, helix angle and tooth form were sufficient to cause the loads to concentrate on the finer-pitch teeth,

and many failures resulted. It was practically impossible to match the mating and complementary gears properly.

Safe working stresses in transmissions are controlled by the type of service and the steels used. In automobiles the constant-mesh gears are usually stressed least, second-speed gears a little more, first-speed gears considerably more, and reverse gears sometimes too highly, as is generally found out afterwards. This depends on the frequency of use. If the stresses in like gears in all of the popular makes of cars were averaged, it would be found that those in constant-mesh gears range between 35,000 and 45,000 lb. per sq. in.; those in second-speed gears, between 45,000 and 60,000 lb. per sq. in.; those in first gears between 60,000 and 110,000 lb. per sq. in., and those in the reverse gears between 80,000 and 130,000 lb. per sq. in. These figures are based on the Lewis formula with the "y" factor determined from the actual lay-out and not from handbooks. These figures seem quite high and cause one to wonder what the life of the gears would be.

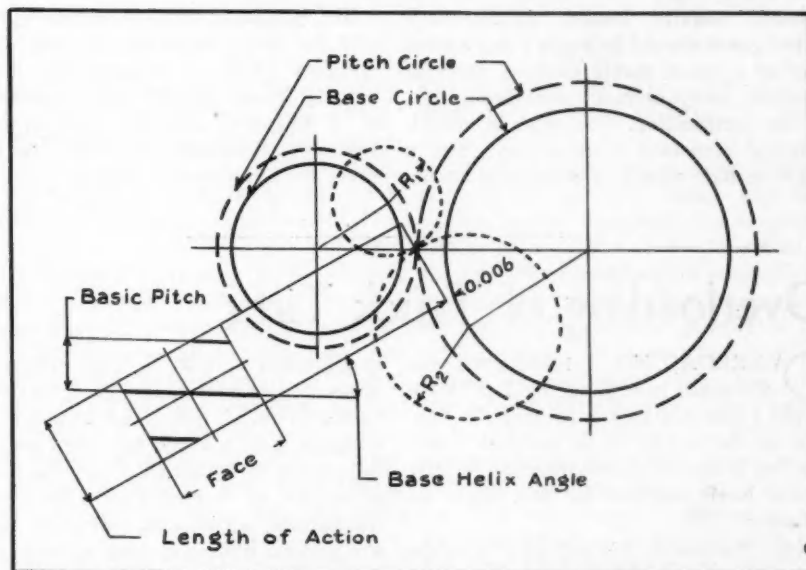
Practically all transmissions of present-day cars use helical teeth, and the following graphical method of computing the stresses in these teeth under load was given by the author:

The diametral pitch and pressure angle are first selected, based on a rough estimate of the nature of the job and size required. Each set of mating

Activities of the S. A. E. Meeting in Chicago

gears is then laid out ten times full size. The addendums are then proportioned so that the line of action begins at about 0.006 in. above the base circle. This is about one-sixteenth of an inch on the layout. The contours of the teeth are then determined by the usual method and the "y" factor of the Lewis formula is obtained. The effective length of face is then determined graphically by constructing the rectangle shown in Fig. 1, the length of the line of action forming one side and the nominal face of the gear the other. Then through the center of the rectangle a diagonal is drawn making an angle equal to the base helix angle of the tooth with the base. This angle is slightly less than the angle at the pitch circle. Parallel with this diagonal other lines are drawn whose spacing is equal to the base pitch of the teeth. The sum of the lengths of these diagonals is equal to the effective length of the gear face.

The necessary face width having been determined, one can judge whether the pitch, pressure angle and number of teeth were correctly chosen. The



The paper of A. W. Frehse showed how the length of the gear face is determined graphically

tangential load is taken normal to the helix angle and the tooth stress then determined by the Lewis formula.

standard alloy carburizing gear steel and in most applications it gave very satisfactory results. Before the advent of controlled hardenability and grain-size specifications, distortion in quenching and poor fractures were the rule, so that the steel of this specification then in common use achieved a bad reputation for distortion difficulties.

The new knowledge of grain-size and hardenability control has made possible the production of case-hardened gears of extremely low distortion in almost any grade of steel. It has also eliminated the coarse crystalline fracture characteristic of the coarse-grained steels.

Since there is little difference as regards mechanical properties between such low-alloy steels as 3115, 4615 and 2315, when they are treated to develop their best properties, the selection can well be made on a price basis, in which case 3115 is the logical choice. With proper design and rigid mountings, it is practically impossible to show a consistent difference in favor of one or the other of these steels, provided all are properly heat treated.

Low Carbon Case-Hardened Steel Gears for Tractors

FOR tractor gears, low-carbon, case-hardening steels are preferable to the higher carbon, oil-hardening steels, according to W. H. McQuaid of the Republic Steel Corporation. The oil-hardening steels are less resistant, and unless the gears are cyanided, they will wear much quicker. The real problem for the tractor engineer therefore is one of selecting a carburizing steel which is satisfactory in performance and most economical from the standpoint of overall cost.

Case-hardening steels really divide into three groups, viz.: (1) the carbon-manganese type; (2) the low-alloy type, such as S.A.E. 3115 and 4615, and

(3) the high-alloy type, such as chromenickel, molybdenum and Krupp steels. The plain carbon-manganese grade with sufficient manganese (approximately 1 per cent) to permit oil quenching, and abnormal enough to insure case toughness and low distortion, will approach the low-alloy grade in properties, which grade is largely used for tractor gears. The low-alloy grades are somewhat better in case strength than the carbon-manganese fine-grained steels, and with the present limited background of the carbon-manganese steels, attention should be centered on the low-alloy steels.

For many years S.A.E. 3115 was the

One of the most important metallurgical properties of a gear steel is its ability to maintain its surface hardness when operating at high surface temperatures. Gears lubricated by splash, such as bevel pinions, develop much higher skin temperatures than would be expected from the oil temperature in the housing. The skin temperature may go as high as 400 deg. Fahr. in heavily loaded applications, especially if the slide is high. Steels which tend to soften at these temperatures, such as the plain carbon or straight nickel steels, soon develop a soft surface and wear rapidly. For this reason, heavily loaded, splash-lubricated gears should be made from a steel having a more stable carbide, such as chrome, molybdenum, vanadium, etc., in its composition. The type of metallurgical structure is important, and a high carbide partially austenitic struc-

ture, which will work harden, is considered the most desirable. This structure is obtained by using an analysis containing nickel in combination with chromium, molybdenum, etc.

It is for this reason that the direct-quenched steels containing nickel in combination with chromium or molybdenum are so successful in automotive final drive applications. Direct quenching from the carburizing temperature is required to give the stable structure desired, and the steel-making practice must be regulated to eliminate grain growth at the high-quenching temperatures employed.

Mr. McQuaid gave it as his opinion that the use of alloy steels of the higher strength (and, incidentally, higher priced) group should not be necessary in a properly designed tractor gear assembly, although they may sometimes save an overstressed design.

Overloading of Truck Tires

OVERLOADING of truck tires was discussed in a paper by J. E. Hale of the Firestone Tire & Rubber Co. Premature failure of tires through overloading is due to three different effects, which were outlined by Mr. Hale as follows:

(1) Excessive flexing of the cord body structure which fatigues the cords so that finally they weaken to the point where they develop into what is known as a "flex break."

(2) The greater the load on any tire, the greater the rise in temperature levels in the body of the tire due to dissipation of energy through molecular friction of the rubber and cotton. The result of the increased temperature is to definitely bring about deterioration in both the cotton and rubber stocks; also, both the rubber and cotton in the heated condition have their physical characteristics changed so that tires are particularly susceptible to "separations" and under rough road conditions are likely to develop what are called "impact breaks."

(3) Increased loads mean increased physical stresses in various parts of the tires, particularly in developing a shear tendency which in addition to the heat mentioned above, contributes to the problem of "tread separation."

These extra stresses develop more abrasion against the road surface, which results in faster tread wear; and, finally, increased stresses develop in the bead region, which have a tendency to produce a weakness in the means of attachment to the rim.

While the term "overload" is commonly used in engineering, its signifi-

cance when applied to tires frequently is not fully understood. The great variations in speed, heat, load, road-surface irregularities and air pressure make it impossible to establish a definite factor of safety, as in beams or other simple mechanical structures. Besides, there are several different types of wear and failure in the case of tires. About all that can be done is to show the general effect of loading on tire life, and this is done for the various sizes in Fig. 1. If we take the 9.00-20 tire as an example, which has a rated capacity of 3250 lb., we see that the plot shows a life of 35,000 miles. If a tire of this same size is overloaded 100 per cent, carrying a load of 6500 lb., the plot shows that its life will be reduced to

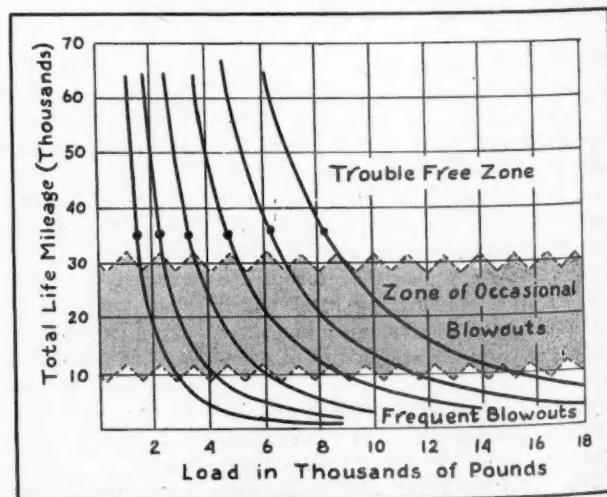
7500 miles. The plot, of course, is not an accurate guide to the life of a tire in any particular case, as road-surface conditions, variations in speed, seasons and climate, neglect and abuse, air pressure and different brands of tires will affect the results in individual cases.

The curves in the plot indicate that the mileage varies approximately inversely as the square of the load. It will also be noticed that the plot is subdivided into three zones—a trouble-free zone, a zone of occasional blow-outs, and a zone of frequent blow-outs. There is no sharp line of demarcation between these zones, and evidently they should merge into each other. What it is intended to convey is that as tires are operated under heavier loads, their durability becomes more seriously impaired from the interference of body-ply failures, which take them out of service prematurely.

At what point on any of the curves overloading begins is a question on which it would be difficult to obtain general agreement. With the aid of these curves the operator can set his own normal tire-life expectancy by setting his load limits accordingly. Public usage has developed such a tire-mileage expectancy, which has gone up year after year, and owners now expect anywhere from 25,000 to 40,000 miles.

As a matter of fact, tire durability has increased greatly, as a result of four factors. These factors may be listed as follows: First, gradual improvement in the tires themselves as the tire companies have made progress in perfecting their products; second, the increasing effectiveness with which the truck manufacturers study the truck-buying prospect's operating conditions and urge choice of adequate tire and rim equipment on new trucks; third, attention on the part of owners to

A graph of J. E. Hale showed the effect of overloading truck tires. The curves represent, from left to right, the following tire sizes—6.00, 7.50, 9.00, 10.50, 12.00, 13.50



proper inflation and care against injuries and abuse; and fourth, much improved highways; also a better un-

derstanding of the economies of adequate tire size on the part of the transportation industry.

above chart before obsolescence is reached.

An analysis of hundreds of cost records has shown that the higher-priced trucks doing the same work as, or more than, the lower-priced trucks will operate for from $\frac{1}{2}$ to $1\frac{1}{2}$ cents less per mile, and with a decrease in repair

Economical Loading of Trucks

IN a paper on "The Economical Loading and Operation of Motor Trucks," A. J. Scaife of the White Company said commercial vehicles today are rated by guesswork and there is no method by which the true rating can be accurately established. An analysis of specifications in the July issue of *Commercial Car Journal* showed the following tonnage and gross ratings of four-wheel trucks:

Tonnage	Gross weight ratings
1-ton	7,100-11,000 lb.
1½ tons	6,000-12,500
2 tons	11,400-19,000
2½ tons	13,000-26,000
3 tons	16,300-32,000
3½ tons	19,000-25,000
4 tons	19,000-38,000
5 tons	23,000-37,000

During the summer and fall months of 1934, the Bureau of Public Roads of the U. S. Department of Agriculture, in cooperation with Johns-Hopkins University, the Maryland State Road Commissioner, and the Commissioner of Motor Vehicles of Maryland, operated two road stations at which commercial vehicles to the number of 10,700 were weighed and measured. From an analysis of the data obtained it is concluded that overloading is much more common with small than with large vehicles. The average load of the 1½-ton vehicles varied between one and one and two-thirds their rated load, while the average load of the 5-ton trucks was about equal to their rated load. More 1½-ton trucks than 5-ton trucks were found carrying loads of between six and ten tons. The results of the check-up were given in the paper in the form of tables and charts.

It is evidently difficult to judge a motor truck by the gross rating method alone, as the method of rating is different with every manufacturer. The tonnage rating is primarily for tax purposes. The load-carrying value of a motor truck can be best gaged by analysing the components and determining the following factors: Chassis weight, axles, engines, transmission, clutches, frame and tires.

Some objection will be raised to including chassis weight as a measure of value, but a comparison of the different chassis in the field and of the different units in the chassis that are comparable will show very little difference in chassis weight. Compare the rated capacity of the bearings in the axles. The higher the rating, the heavier the axle. Axles having the same rated capacity will weigh about

the same. Engines of the same cu. in. displacement weigh about the same. Transmissions and clutches having an input-torque capacity of 10-15 per cent in excess of the engine torque will weigh about the same. Frames suitable for the above axles, engines, etc., will weigh about the same. Tires, wheels and springs large enough to carry the load will weigh about the same. Adding these different items we arrive at the conclusion that it is a good rule to use chassis weight as a measure of carrying ability. When the above is taken into consideration the price will vary by only a few dollars. But the ultimate cost is more important than the first cost.

The first cost is only about 20 per cent of the total cost of owning a motor truck, yet the former frequently receives major consideration. The remaining 80 per cent of the cost of truck operation is about the same for all trucks of the same size. Such fixed-cost items as license fee, insurance, and rent are about the same for all trucks. The items of fuel, oil and tires vary with road and load conditions and with trucks of the same specifications. Depreciation will be less on a higher-priced, quality truck than on a cheaper, overloaded truck.

Many records show that the economic life is greater than that shown by the

For the Same Depreciation, a Higher Priced Truck Will be off the Books

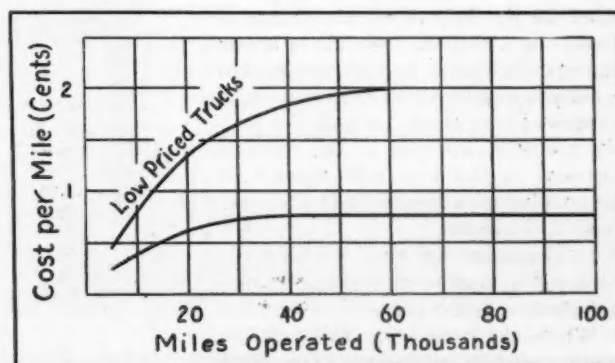
A Difference in First Cost of	With a Life of	
\$100	5 years or 100,000 miles	5 months later or 8,000 miles more
200	4½ years or 90,000 miles	10 months later or 13,000 miles more
300	3½ years or 70,000 miles	12 months later or 20,000 miles more

cost of 1 cent per mile a difference in first cost of \$200 is offset in 20,000 miles.

One department store in an Eastern city operating both high- and low-priced trucks analysed the operating cost over a period of 60,000 miles for the low-priced and 100,000 miles for the high-priced trucks. The repair costs for the two groups are plotted in Fig. 1. This analysis shows that in 27,000 miles of operation each low-priced truck cost \$229.50 more for repairs than the high-priced unit, this amount being practically equal to the difference in first costs. At this mileage the repair costs were more than twice as great for the low-priced than for the high-priced truck, and they continued to increase further up to the 60,000-mile limit. At the end of 60,000 miles the total repair cost was \$1,170 for the low-priced truck and \$450 for the high-priced. This gives a difference in repair costs at 60,000 miles of \$720, which was more than three times the difference in the first costs.

Mr. Scaife concluded his paper by giving it as his opinion that when all items of cost are considered, there is no economy in the purchase or use of a low-capacity, low-priced truck, heavily overloaded, as compared with a truck of higher price and greater carrying capacity.

Repair cost per mile as affected by service life

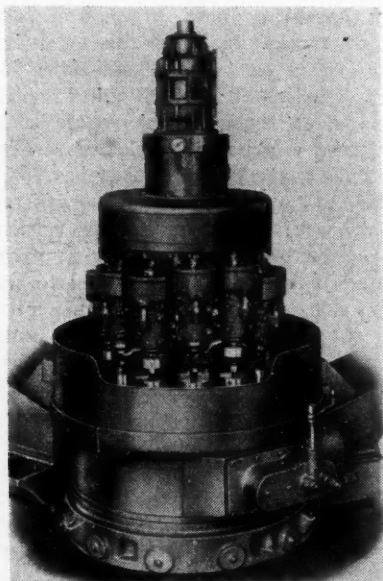


NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Roto-Broach on Bullard Contin-U-Matic

In Roto-Broaching, which was developed by The Bullard Company of Bridgeport, Conn., the work is subjected, while rotating at cutting speeds, to the action of the tool, the blade edges of which are arranged to approach the



Contin-U-Matic for Roto-Broaching

work surface at an angle and at a relatively low speed. In this way the cutting action passes along the blade from point to point axially of the work so that no one point of the blade is subjected to continuous strain or heat for an excessive time interval.

The manufacturer claims that by the use of Roto-Broaching, tool life is extended, as the burden on each blade is relieved by the fact that the work is being operated upon by as many roughing cutters and finishing cutters as may be required in a single pass of the tool. Only a single chucking of the work is necessary as the tool will operate to both rough and finish at a single pass of one tool block.

The machines employed for this process vary with the work and production requirements, but in general they must provide proper means for rotating the work and also moving the tool relative

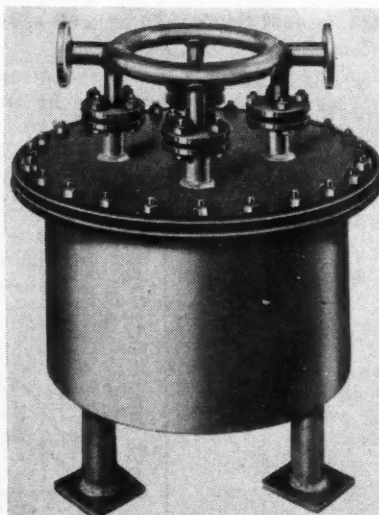
to the work. The illustration shows a 12 spindle Contin-U-Matic equipped with both internal and external Roto-Broach. Six spindles continuously rough and finish internally, while the other six rough and finish externally.

Acid Filter Quickly Cleaned

The new filter recently developed by the R. P. Adams Co. of Buffalo, N. Y., is intended primarily for the clarification of acid solutions used in the plating industry. This filter is a combination of a lead lined housing and a manufactured porous stone filter element. The liquid enters through a single bottom connection, passing through the walls of the porous filter stones and out through the top openings into the collecting header, leaving on the outer walls of the filter tube all sludge, lint or other foreign materials contained in the solution.

An important feature of this design is the ease of cleaning by back washing, it being only necessary to close the acid inlet and outlet valves and flush out the stones and the housing with city water. This operation is said to consume only a few minutes, after which the filter is ready for the recirculation of the acid solution.

These units are available in sizes capable of handling 150 to 3000 gallons per hour.



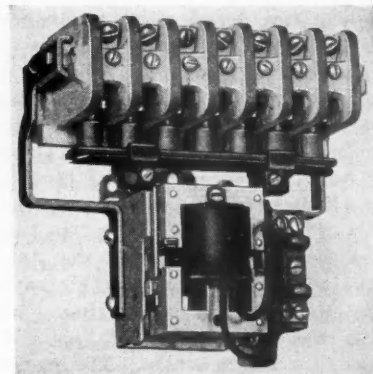
Adams Filter for Acid Solutions

New Products by General Electric

Among the new products recently announced by the General Electric Co., Schenectady, N. Y., is a multiple magnetic contactor, rated at 2 H.P. and intended for use either with small single-phase and polyphase motors, or as a flexible relaying device for complicated control systems such as are used on machine tools.

This new contactor is available with either normally open or closed contacts, or with a combination of both, and may be controlled remotely through push-button stations, limit switches or other pilot devices.

Two new lines of rotating drum switches, one for multi-speed and the other for reversing applications have also recently been added. The multi-speed switches are furnished in two, three or four speed types, with an off position contact. They can be designed for constant or variable torque, and



GE Multiple Contactor

constant or variable horsepower, and are particularly suited to built-in applications.

The reversing switches have a self-locking cam for positioning, but are easily adjusted for spring return or for maintaining contact in either position.

The third new product to be announced, is the mill type D.C. contactor intended for severe service such as in steel mills. These contactors are equipped with "rocker" bearings which are said to be practically unaffected by wear.

Vertical Diamond Tool Boring Machine

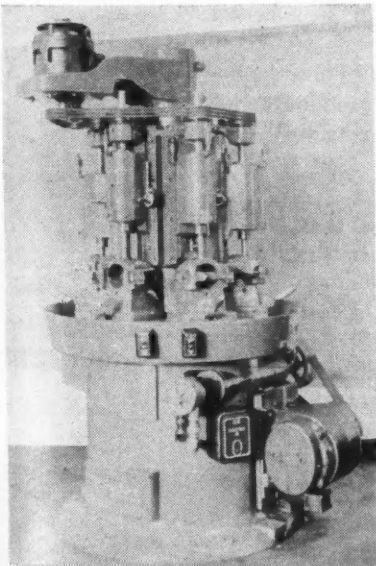
The Automatic Machine Company, Bridgeport, Conn., announces another Coulter diamond tool boring machine

of the vertical six-station revolving turret type, designed for large quantity machining of the bearing holes in connecting rods, pistons, bushings and parts of similar nature. The machine illustrated is arranged for the diamond boring of the wrist pin holes in pistons.

From the spindle motor, power is taken by means of "V" belts contacting all boring spindle sheaves. As the turret revolves, the sheaves leaving the finished work position, gradually move out of contact with the "V" belts, and with the aid of cam-operated friction brakes, the spindles stop before reaching the unloading station. Likewise the spindles just leaving the loading position start to revolve before reaching the first boring position as their sheaves make advance contact with the "V" belts. Thus the boring spindles continue to revolve from the time they leave the loading station until the boring operation is completed and the unloading station is reached.

The spindles are splined to permit the rise and fall of the spindle heads, which movement is controlled by the feed cam mounted on the stationary central column. Feed is by gravity with a bronze shoe riding on the cam.

The power for the operation of the turret is transmitted from a motor on the base of the machine to a worm shaft and gear through "V" belts as shown. This motor also drives the pump which supplies coolant to an annular distributor located inside the base. As the turret turns, a port is uncovered and remains open from the time the spindles first start to turn and bore until the boring operation is completed, when the port is again covered, thereby stopping all flow of coolant during the unloading and loading operations.



Latest Coulter Boring Machine

Automotive Industries

Bluebird Gears Small In Relation to Load

The transmission gears of the Blue Bird, with which Sir Malcolm Campbell recently set a new world's record of more than 300 m.p.h., are comparatively small for the loads transmitted. The full engine power of 2500 hp. corresponds to a tooth load of 14,500 lb. in high gear, which was taken on a face width of 2½ in. The gears were made of high-nickel chrome molybdenum steel, case-hardened, which is said to have a core strength of 180,000 to 200,000 lb. per sq. in., and a direct compressive strength of as high as 540,000 lb. per sq. in. The gears were profile-

ground on the tooth contours. These gears were made by David Brown & Sons.

Trade Literature Received

Thiokol Corporation, Yardville, Trenton, N. J.—Circular of Thiokol synthetic rubber-coating materials.

Aluminum Industries, Inc., Cincinnati, Ohio.—Catalogue of Permite bronze bars. The publication describes the 6-ft. bars of leaded bronze for bearings, bushings, etc., which are manufactured by Aluminum Industries, Inc., and distributed by Joseph T. Ryerson & Son, Inc.

DERMA-SAN

DISINFECTANT



DERMA-SAN

Preventing

Oil Dermatitis

is cheaper than

Curing it



IF, by using Derma-San, you can prevent just one case of Oil Dermatitis, you will be well repaid for your investment. For one worker can infect an entire plant; compel workmens' compensation payments; destroy production efficiency.

Protect your men from this serious skin disease by sterilizing cutting compounds with Derma-San. One pint, added to 35 gallons of lubricant, ends all danger of infection. Thousands of plants use Derma-San. They know they cannot afford to be without it.

The HUNTINGTON

LABORATORIES Inc.

HUNTINGTON

INDIANA

TORONTO, ONT. 72 74 DUNDAS ST.

999 S. Logan St., DENVER, COLO.

DERMA-SAN IS EXCELLENT FOR ALL GENERAL PLANT SANITATION

October 19, 1935



THE AUTOMOTIVE MARKETS TODAY—

A REVELATION

FACTS—reduced to the hard, cold PRECISION of a steel gauge block—indicate the need for more ECONOMICAL and effective advertising and selling in the post-depression era that all business is now entering. ● FACTS—unclouded by hunches and pre-conceived ideas—unhampered by habit and tradition—show the need for a NEW type of business papers “streamlined” to reach with PRECISION and ECONOMY those worthwhile jobber and retail automotive business men who do more than 85 per cent of all the business in their fields. ● Early in 1935, at a conference of Chilton editors and business heads, we decided to get the real, present-day FACTS concerning automotive wholesale and retail markets. ● Those facts are ASTOUNDING! They cannot be ignored! ● Since that epochal meeting at Chilton headquarters we have completed the broadest and deepest investigation of automotive markets and marketing methods that our company has ever made. We have:

- Spent more than \$50,000 making a complete qualitative and quantitative measurement of automotive markets . . . to determine who buys what from whom, and how much.
- Asked wholesalers and retailers nearly 1,500,000 questions.
- Sent out more than 35,000 questionnaires. Received active cooperation from more than 10,000 individual automotive business men.
- Card indexed purchases made by nearly 100 automotive retailers for a year, recording the sources from which they purchase and the dollar volume of their purchases.